COMMERCIAL WASTE MANAGEMENT STUDY

VOLUME II

COMMERCIAL WASTE GENERATION AND PROJECTIONS

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PREFACE

Local Law 74 of 2000 (LL74) mandated a comprehensive study of commercial waste management (Commercial Waste Management Study or Study) in New York City (City) by a Consultant funded by the City Department of Sanitation (DSNY). This Study undertaken to comply with LL74 will assist the City in managing the commercial waste stream in the most efficient and environmentally sound manner, and assist in the development of the City's Solid Waste Management Plan (New SWMP) for the New SWMP Planning Period.

As stated in the Commercial Waste Management Study Final Scope of Work: *"In June 2002, DSNY published a Preliminary Report in accordance with the requirements of LL74 that contained information on commercial waste quantities by type and borough of origin that had been collected and analyzed by DSNY and its consultants from sources such as available reporting systems and interviews with waste management companies involved in aspects of the commercial waste management business. As noted in the Preliminary Report, there is no single comprehensive system for recording data on commercial waste generation in the City. Furthermore, the data in the Preliminary Report were for the calendar year 2000, and the events of September 11, 2001 and the subsequent decline in business activity in the City since 2000 have all affected commercial waste generation. The Study will apply methods to adjust the year 2000 data to year 2002 to account for these economic effects. Additionally, the Study will evaluate and apply alternative methods to those used in the Preliminary Report to supplement existing estimates of commercial waste generation. The recycled material in the commercial waste stream that is not accounted for in the Preliminary Report data will also be quantified. The Study will project changes in commercial waste generation over the New Plan period based on an employment forecast for the same period."*

In addition to this Volume II, the Study consists of five other volumes:

- Volume I: Private Transfer Station Evaluations;
- Volume III: Converted Marine Transfer Stations – Commercial Waste Processing and Analysis of Potential Impacts;
- Volume IV: Evaluation of Waste Disposal Capacity Potentially Available to New York City;
- Volume V: Manhattan Transfer Station Siting Study, and
- Volume VI: Waste Vehicle Technology Assessment.

This volume, Volume II: Commercial Waste Generation and Projections, reports the results of five different evaluations. The reports and appendices that provide the analyses and data in support of this Executive Summary are:

Summary Report on Commercial Waste Generation and Projections

Appendices:

A: Facilities Estimate of Putrescible Waste Generation Year 2002

B: Employment-Based Estimate of Putrescible Waste Generation Year 2002

C: Commercial Putrescible Waste Disposed and Recycled: BIC-DSNY Carter Survey

D: Commercial Putrescible Waste 20-Year Forecast

E: Non-Putrescible Commercial Waste Quantification and Projections

This volume examines the quantities of waste generated within the City that is collected and managed by private carters, i.e., the commercial waste stream. DSNY regulates[1] putrescible, non-putrescible and fill material Transfer Stations that are permitted to receive and process these categories of waste materials. The New York State Department of Environmental Conservation (NYSDEC) also regulates[2] the design, construction and operation of Transfer Stations.

[1] DSNY's regulatory authorities derive from Titles 16, 17 and 25 of the New York City Administrative Code (NYCAC), Title 16 of the Rules of the City of New York (RCNY) and the City Environmental Quality Review (CEQR) Procedures.

[2] NYSDEC's regulatory authority derives from Title 6 of New York Codes, Rules and Regulations (NYCRR) Part 360 and Title 6 NYCRR Part 617 under the state's Environmental Conservation Law (ECL).

Commercial Waste, as discussed in this report, is comprised of three types of waste, as defined in DSNY rules:

1. Commercial putrescible waste[3] is solid waste generated by the City's businesses, containing organic matter having the tendency to decompose with the formation of malodorous by-products. It is principally office and retail waste with small quantities of putrescible material, but also includes restaurant and other waste. Significant amounts of office waste are recycled directly at the source by carters that primarily collect recyclable office paper from commercial buildings and deliver it to recyclers, exporters or paper manufacturers. Consistent with DSNY's rules defining three basic types of waste generated, the term putrescible waste, as used in this report, includes the portions of commercial putrescible waste that are both disposed and recycled (such as office paper).

2. Non-putrescible waste is waste that does not contain organic matter having the tendency to decompose with the formation of malodorous by-products, including but not limited to dirt, earth, plaster, concrete, rock, rubble, slag, ashes, waste timber, lumber, Plexiglas, fiberglass, ceramic tiles, asphalt, sheetrock, tar paper, tree stumps, wood, window frames, metal, steel, glass, plastic pipes and tubes, rubber hoses and tubes, electric wires and cables, paper and cardboard.

3. Fill material is a subset of non-putrescible waste and, as defined in DSNY rules, is clean material consisting of earth, ashes, dirt, concrete, rock, gravel, asphalt millings, stone or sand.

[3] As defined in DSNY rules (Subchapter A of 4 RCNY 16).

EXECUTIVE SUMMARY

Scope of Analysis/Approach

The Study employed three different methodologies to develop independent estimates of commercial putrescible waste quantities for the years 2002 and 2003, as described in Appendix A (Facilities Estimate of Putrescible Waste Generation Year 2002), Appendix B (Employment-Based Estimate of Putrescible Waste Generation Year 2002), and Appendix C (Commercial Putrescible Waste Disposed and Recycled: BIC-DSNY Carter Survey). The independent estimates were compared for reasonableness to the data obtained through DSNY's Quarterly Transfer Station Report system (Quarterly Reports). Quarterly Reports are required to be completed by DSNY-regulated Transfer Station operators/owners. The Quarterly Reports do not account for all of the commercial waste generated in the City. Waste not reflected in the Quarterly Reports includes waste that is disposed out-of-City or recycled commercial waste that does not pass through the City's network of private Transfer Stations. The waste quantity estimates developed from the other estimation methodologies corroborated the Quarterly Report data for quantities processed at City Transfer Stations.

All these data sources were used to establish a new, year 2003 baseline estimate inclusive of the total commercial putrescible waste generated, i.e., disposed in and out of the City, and recycled. The new baseline year 2003 estimate accounts for the job loss effects of 9/11 and the subsequent economic recession, and therefore provides a sound starting point for projecting waste generation for the New SWMP Planning Period.

These data sources were also compared to the year 2000 waste quantity estimates in the Preliminary Report (which did not include recycled material) and used as a basis for adjusting Preliminary Report estimates of putrescible waste disposed to eliminate inconsistencies in waste-type definitions and carter classifications, and to establish a revised year 2000 estimate of

8,381 tons per day (tpd)[4] disposed. Comparing the year 2000 estimate of putrescible waste disposed with the 2003 total net disposed (based on three quarters of DSNY Quarterly Reports and direct export totals estimated from the BIC-DSNY carter survey), shows a decline of 1,131 tpd, or 13.5%, in putrescible waste disposed over that period of time.

The ***Facilities Estimate*** (Appendix A) relies upon DSNY's Quarterly Reports for data on waste quantities delivered to Transfer Stations in the City in 2002. Through an extensive survey effort, new data were collected on waste carted out-of-City for disposal and also on recycled waste from commercial sources in the City that was processed in or out of the City or directly exported to foreign sources. Approximately 31% of the City's putrescible waste was recycled in 2002.

The ***Employment-Based Estimate*** (Appendix B) used post-9/11 estimates of City employment that reflected the effects of the economic recession on employment, and relied on waste generation factors for commercial business sectors developed through a literature search. These data were used to estimate citywide waste generation for the year 2002 as a function of employment in the City.

The ***BIC-DSNY Carter Survey*** (Appendix C) assembled information from a survey of the City's licensed carting industry conducted in the fall of 2003. The surveys, collected from all carters collecting in the City and followed up in person or via phone interviews, developed data that resulted in an estimate of commercial putrescible waste disposed and recycled in 2003 that included the quantities processed at in-City and out-of-City locations and quantities collected for recycling. Approximately, 27% of the City's commercial putrescible waste was recycled in 2003, a decline of 4% from the prior year. This decline is consistent with nationally reported data on paper markets.

[4] Tons per day are calculated on the basis of a six-day collection week, equivalent to a 312-day year.

The 2003 baseline waste estimate was allocated among the five boroughs using collection route data obtained from the BIC-DSNY carter survey. Based on this borough allocation, and using projected employment over this period, the quantity of commercial waste generated (both disposed and recycled) was forecast for the New SWMP Planning Period, for each borough. The relative proportions of waste generated by each borough change as a function of changes in projected employment over time. The forecast assumes that the percentage of materials recycled by each borough would remain constant at 2003 levels[5] for the New SWMP Planning Period. These projections are discussed in Appendix D: ***Commercial Putrescible Waste 20-Year Forecast***.

Quantities of non-putrescible waste, which include construction and demolition debris (C&D) and fill material, were estimated based upon waste generation rates derived from a literature search for three types of residential and commercial construction projects: new construction, demolition and renovation. A regression analysis of data obtained from F.W. Dodge on actual and projected construction activity in the City in each of these respective areas over the period of 2000 to 2007 was used to develop projections of the generation of C&D waste over the New SWMP Planning Period. Non-building-related C&D, which would include clean fill, was estimated by obtaining waste generation factors expressed as tons per $1,000 of activity. These factors were applied to the value of this construction in the City obtained from F.W. Dodge. Details of these estimates are discussed in Appendix E: ***Non-Putrescible Commercial Waste Quantification and Projections***.

The estimates of commercial putrescible and non-putrescible waste are relevant in determining the Transfer Station capacity required to serve the City's businesses over the next 20 years.

[5] Percentages developed from 2003 BIC-DSNY City carter collection truck and fax-back surveys data plus recycling at City Transfer Stations plus estimated recycling through the deposit container redemption system.

Findings

- In 2003, approximately 3,085,000 tons, or 9,889 tpd, of putrescible waste and approximately 8,641,000 tons, or 27,695 tpd, of non-putrescible waste and clean fill material were generated by the commercial sector in the City. Quantities of waste generated include that which is disposed and recycled.

- In 2003, approximately 6,209 tpd of commercial putrescible waste[6] were processed for disposal at in-City Transfer Stations and 1,039 tpd were processed at out-of-City facilities. (Although some material is recycled at putrescible Transfer Stations, the vast majority is material destined for disposal.) An estimated 2,641 tpd were recycled directly. The quantities processed out-of-City represent a 21% increase over 2002.

- Of the total commercial putrescible waste generated, 42% is generated in Manhattan,[7] 19% in Brooklyn, 13% in the Bronx, 20% in Queens and 5% in Staten Island.[8]

- Overall, approximately 27% of the commercial putrescible waste was recycled in 2003.

- Quantities of commercial putrescible waste generated are anticipated to increase to 3,414,000 tons, or 10,942 tpd in 2024, which represents an annual average rate of increase of 0.5%.

- Quantities of non-putrescible commercial waste and clean fill are more difficult to predict in the future due to the variability in generation from year to year, but are anticipated to range from approximately 8.0 to 10.9 million tons, (25,640 to 34,810 tpd) by the end of the New SWMP Planning Period.

- The City's commercial putrescible waste (disposed and recycled) is collected by approximately 124 licensed carters.

[6] These quantities do not include DSNY-managed Waste processed at in-City Transfer Stations.
[7] 61% of the City's jobs are located in Manhattan.
[8] Numbers may not add due to rounding.

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List of Acronyms/Definitions

Acronyms	
BIC	Business Integrity Commission
C&D	construction and demolition
CD	community district
CDEP	Connecticut Department of Environmental Protection
CEQR	City Environmental Quality Review
DSNY	New York City Department of Sanitation
ECL	State Environmental Conservation Law
lbs/cy	pounds per cubic yard
LL74	Local Law 74, effective December 19, 2000, enacted by the City Council, requiring a comprehensive assessment of commercial solid waste management in New York City
MGP	metal, glass and plastic
MOP	mixed office paper
MRF	materials recycling facility
MSW	municipal solid waste
NJDEP	New Jersey Department of Environmental Protection
NYCAC	New York City Administrative Code
NYCDCP	New York City Department of City Planning
NYCRR	New York Codes, Rules and Regulations
NYMTC	New York Metropolitan Transportation Council
NYSDEC	New York State Department of Environmental Conservation

Acronyms	
NYSDOL	New York State Department of Labor
OCC	old corrugated cardboard
ONP	old newsprint
PIU	DSNY's Permit and Inspection Unit
RCNY	Rules of the City of New York
SIC	Standard Industrial Classification
tpd	tons per day
tpy	tons per year
USEPA	United States Environmental Protection Agency
WTE	waste-to-energy

Definitions	
City	New York City
Consultant	The DSNY's Consultant Team, including Henningson, Durham & Richardson Architecture and Engineering, P.C.; Parsons Brinckerhoff Quade and Douglas, Inc.; Ecodata, Inc.; Franklin Associates, Ltd.; Urbitran Associates, Inc.; HydroQual, Inc.; and Cambridge Environmental, Inc., who prepared the Commercial Waste Management Study
DSNY-managed Waste	Solid waste that DSNY collects from all residential households in the City and the institutional waste of City, state and federal agencies that DSNY collects and/or for which DSNY arranges disposal
Final Study Scope or Final Scope of Work	Commercial Waste Management Study Final Scope of Work issued on July 31, 2003
New SWMP	The new comprehensive Solid Waste Management Plan to be developed in 2004 for both DSNY-managed Waste and commercial waste for the planning period 2004 through 2024
New SWMP Planning Period	The 20-year period from 2004 to 2024 addressed by the City's New Solid Waste Management Plan
Preliminary Report	The New York City comprehensive Commercial Waste Management Study Preliminary Report dated June 2002
Quarterly Reports	DSNY's Quarterly Transfer Station Report system
Study	Commercial Waste Management Study
Transfer Station(s)	Privately owned and operated transfer station in New York City that accepts, transfers and transports some portion of municipal solid waste or construction and demolition debris or fill material generated in the private sector for out-of-City disposal

1.0 WASTE QUANTIFICATION SUMMARY REPORT

1.1 Introduction and Background

This report provides estimates of the quantity of commercial waste generated in New York City (City) and projects estimates of the future quantities that will be generated during the New SWMP Planning Period. It summarizes information that is presented in greater detail in Volume II, Appendices A through E, of the Commercial Waste Management Study (Study).

Commercial waste is a category of municipal solid waste (MSW) and is comprised of three types of waste, as defined in City Department of Sanitation (DSNY) rules: putrescible, non-putrescible and fill material. Commercial waste is generated by businesses in the City, including construction projects, and is collected by private carters, who either: (1) deliver their waste to private in-City Transfer Stations, from which the waste is recycled or hauled to out-of-City disposal sites; or (2) directly haul the waste to out-of-City transfer stations or disposal sites.

These waste quantity estimates are important in evaluating the current adequacy and the future demands on the City's existing network of private Transfer Stations.

1.1.1 Commercial Waste Types

DSNY rules classify commercial waste into two major categories and one sub-category. These are:

1. Putrescible waste – Solid waste generated daily by the City's business establishments that is principally office and retail waste with small quantities of putrescible[1] material, and also includes restaurant and other waste. Significant amounts of office waste are recycled directly at the source by carters that primarily collect recyclable office paper from commercial buildings and deliver it to recyclers, exporters or paper manufacturers. Consistent with DSNY rules, putrescible waste referred to in this report is inclusive of the fractions that are disposed and recycled (such as office paper). Some additional recycling occurs at the City's putrescible Transfer Stations, where old corrugated containers, commonly referred to as cardboard (OCC), and concentrated loads of office paper are diverted to recyclers.

[1] Putrescible solid waste is solid waste containing organic matter having the tendency to decompose with the formation of malodorous by-products.

2. Non-putrescible[2] waste – Inert waste that does not contain organic matter having the tendency to decompose with the formation of malodorous by-products, including but not limited to dirt, earth, plaster, concrete, rock, rubble, slag, ashes, waste timber, lumber, Plexiglas, fiberglass, ceramic tiles, asphalt, sheetrock, tar paper, tree stumps, wood, window frames, metal, steel, glass, plastic pipes and tubes, rubber hoses and tubes, electric wires and cables, paper and cardboard. It is typically generated from commercial and residential demolition, new construction and renovation projects. This waste can vary significantly with the volume of construction activity in the City. It is comprised of a range of inert materials, some of which is recycled. The non-recycled fraction of the waste is densified and transferred to the City's non-putrescible Transfer Stations for disposal. This report also refers to this waste as construction and demolition (C&D) debris to distinguish it from fill material, which is also a category of non-putrescible waste.

3. Fill material – A subset of non-putrescible waste, and as defined in DSNY rules, is clean material consisting of earth, ashes, dirt, concrete, rock, gravel, asphalt millings, stone or sand, provided that such material shall not contain organic matter having the tendency to decompose with the formation of malodorous by-products. Typically these materials are stockpiled for reuse at the City's fill material Transfer Stations. Almost all fill material is reused.

Significant quantities of materials in each of the above categories are recycled. This report also provides information on waste recycled within the putrescible waste category. The sum of waste disposed and waste recycled equals the waste generated in each category.

1.1.2 Types of Commercial Waste Transfer Stations

DSNY permits three different categories of Transfer Stations that receive and process the above-noted waste materials. The DSNY rules applicable to each are found in Chapter 4 Title 16, Rules of the City of New York (RCNY). The New York State Department of Environmental Conservation (NYSDEC) also regulates the design, construction and operation of Transfer Stations under Title 6 of the New York Codes, Rules and Regulations (NYCRR), Part 360. NYSDEC regulations classify Transfer Stations into three categories: putrescible, non-putrescible and clean fill facilities.

[2] As defined in DSNY rules (Subchapter A of 4 RCNY 16).

1.1.2.1 Putrescible Waste Transfer Stations

Putrescible waste Transfer Stations receive waste delivered in waste collection vehicles (e.g., packer trucks or roll-off containers). They typically process the waste by sorting out bulky items, and then generally crushing, baling or compacting the waste. The processed waste is placed into transfer trailers for over-the-road long haul, or into intermodal containers for export by rail to out-of-City disposal locations.

All but one of the putrescible Transfer Stations in the City transfer the waste received to disposal facilities in trailer trucks that can carry approximately 22 to 25 tons per transfer trailer. Typically, one transfer trailer or one intermodal container consolidates the waste delivered by approximately two typical collection vehicles. All putrescible Transfer Stations operate with scales, and all waste processing operations must occur in an enclosed building.

1.1.2.2 Non-Putrescible Waste Transfer Stations

C&D debris is typically delivered to non-putrescible Transfer Stations in roll-off containers that are picked up from demolition, new construction or renovation sites. These Transfer Stations typically engage in sorting, crushing and processing of the C&D debris material. Some facilities sort the materials to recover recyclables such as metal, wood or aggregate; they recover some materials for recycling and reduce the volume of waste disposed.

As of early 2003, there were 28 non-putrescible Transfer Stations in the City, and approximately 60% of the tonnage was weighed. The waste processing operations typically occur outdoors. Some facilities have paved surfaces for processing; others operate with unpaved sites. Processed waste is loaded into transfer trailers for over-the-road long haul to out-of-City disposal locations. Some non-putrescible Transfer Stations operate with scales, but others record materials handled based on inbound and outbound truck volumes (cubic yards).

1.1.2.3 Fill Material Transfer Stations

Fill material Transfer Stations typically receive loads of excavated dirt, rock, concrete, etc., from construction sites, including roadwork and other public works projects. They typically have equipment on site that is used to sort the aggregate into various sizes. The majority of the material received is stored on site and recycled or reused. Very little size reduction takes place, as most of the processed materials are stockpiled on site and reused in other projects. None of the fill material Transfer Stations have scales.

1.1.3 Commercial Waste Collection

The carting (commercial waste collection) industry that collects putrescible and non-putrescible waste in the City is regulated by the City's Business Integrity Commission (BIC). BIC maintains a registry of carters that are licensed to collect putrescible and non-putrescible waste, qualifies business entities to provide carting services, and regulates the rate charged for collection.

BIC has cooperated with DSNY in implementing a first-time survey to collect information directly from the carter industry. The survey obtained data on the quantities and origins of commercial waste collected within the City. This report uses these estimates as one source of data for developing a year 2003 baseline estimate of putrescible waste generation, inclusive of disposed and recycled fractions, for use in forecasting future quantities.

1.1.4 Commercial Waste Data Collection and Reporting

Unlike the reporting system for DSNY-managed Waste, there is no central database that records all of the waste generated, recycled and disposed by point of origin, destination and type of material received. DSNY, as a regulator of the City's Transfer Stations, has, since 1995, maintained and refined a reporting system, the Quarterly Transfer Station Report system (Quarterly Reports), which collects data on the quantities of waste delivered to in-City Transfer Stations. This reporting system, while providing very useful and reliable information, does not account for waste disposed out of the City or waste recycled at the source of generation, e.g., recycled office paper.

Although all of the City's putrescible Transfer Stations record inbound and outbound material by weight, in early 2003 only 60% of the tonnage was weighed at non-putrescible facilities, and none of the incoming fill material was weighed. Consequently, in early 2003, approximately 80% of the reported tonnage in the Quarterly Reports for C&D and fill material Transfer Stations reflects a conversion of cubic yard volume data to tons, based on assumed factors for converting cubic yards to tons.

In accordance with Local Law 74 of 2000 (LL74), DSNY published the Comprehensive Commercial Waste Management Study Preliminary Report (Preliminary Report) in June 2002. This report presented preliminary data for the year 2000 on the volumes, types, origins and destinations of commercial putrescible and non-putrescible waste managed by private carters and Transfer Stations in the New York metropolitan area, as well as on DSNY-managed Waste. The data for this report were developed during the period when the Fresh Kills Landfill was still receiving waste, and prior to the events of September 11, 2001.

The impact of September 11 and the business recession in the City during the period of 2001 to 2003 influence developing estimates of commercial waste generation. The City comptroller has estimated that the City suffered a loss of over 200,000 jobs during this period, and commercial putrescible waste generation correlates with levels of employment. Post-2001 estimates of waste generated and future projections have to address the impact of these events on waste generation between the period of 2002 and 2003.

The estimates of commercial putrescible and non-putrescible waste are relevant to the types and amounts of Transfer Station capacity that will be required to serve the City's businesses over the New SWMP Planning Period. This report updates the estimates contained in the Preliminary Report based on new information developed for the years 2002 and 2003, and provides a new 2003 baseline estimate of commercial putrescible waste generation as the basis for forecasting commercial putrescible waste generation over the New SWMP Planning Period.

1.2 Objectives

The objectives of this report are to:

1. Report on current estimates for the years 2002 to 2003 of the quantities of each type of commercial putrescible waste generated, recycled and disposed.
2. Compare these more recent estimates with those provided in the Preliminary Report, make adjustments as indicated, and establish a year 2003 baseline for commercial putrescible waste generated.
3. Forecast, from the year 2003 baseline estimate, the quantities of commercial putrescible waste to be generated, recycled and disposed over the New SWMP Planning Period.
4. Use current estimates of commercial non-putrescible waste and forecasting methodologies to project the quantity of commercial non-putrescible waste to be generated over the New SWMP Planning Period.

2.0 METHODOLOGIES FOR ESTIMATING WASTE QUANTITIES

The different methodologies used to estimate current quantities and to develop projections for each specific type of commercial waste are summarized in this section.

2.1 Putrescible Waste Disposed and Recycled

Estimating the quantities of the commercial putrescible waste generated involved the following:

- Three different methods were utilized to develop independent estimates of waste quantities for the years 2002 and 2003, and are described in detail in Volume II, Appendices A, Facilities Estimate; B, Employment-Based Estimate; and C, BIC-DSNY Carter Survey.
- These different estimates were compared for reasonableness to the year 2000 estimate in the Preliminary Report, used to adjust the Preliminary Report data to more accurately reflect the quantity of commercial putrescible and non-putrescible waste disposed in the year 2000 (the Preliminary Report did not estimate total waste recycled), and used to establish a baseline estimate for 2003.
- A forecast methodology was developed and applied to the baseline to project waste over the New SWMP Planning Period.

2.1.1 Facilities-Based Estimating Methodology

The DSNY Quarterly Report system was implemented in 1995 and has been maintained and refined since that time. It provides accurate data from scale weights for putrescible waste tipped at in-City Transfer Stations and records the quantity of materials recycled at these facilities. This system is a primary source of data for estimating putrescible waste tipped at Transfer Stations in the City.[3]

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[3] Under the Interim Export Program, DSNY delivers DSNY-managed Waste to eight in-City putrescible Transfer Stations. DSNY deliveries were therefore subtracted from the total quantities to estimate the quantity from commercial sources.

Data on putrescible waste generated by commercial sources in the City and carted to either Transfer Stations or out-of-City disposal sites was collected through a survey for the year 2002 and described in detail in Volume II, Appendix A to this Study. Lists of facilities located within a 50-minute traveling radius of the City -- located in Connecticut, New Jersey and Westchester and Nassau Counties in New York -- were developed by contacting state agencies. Telephone surveys of operators of these facilities were used to collect information on the quantity of putrescible waste originating in the City and tipped at those locations.

To estimate total waste generation, data on materials recycled from commercial sources in the City was also developed. Sources of information included the major carters in the City who pick up recyclables; state agencies (for lists of recyclables processors in the region); the Yellow Pages (for listings of recycling centers); end-user markets (such as fiber mills); and brokers involved in the paper export business. The information obtained from these sources was cross-checked and organized into a database to estimate the quantity of recyclables.

The combined total of putrescible waste disposed and waste recycled materials was 3,295,677 tons (10,563 tons per day [tpd]) in 2002, as reported in Table 3.3.4-1 of Volume II, Appendix A.

2.1.2 Employment-Based Estimate

A second, independent estimating methodology for commercial putrescible waste generation in the City used available employment data. This methodology is described in detail in Volume II, Appendix B of the Study. This approach used a literature search to develop waste generation factors, expressed as tons of waste generated per employee per year, for specific types of businesses with significant employment in the City. Table 2.1.2-1 lists the factors developed through this research and used in this report. These business sector-specific factors are multiplied by sector-specific employment to estimate total commercial putrescible waste generation in the City.

Table 2.1.2-1
Employment Categories, Commercial Waste Generation Factors and Tons Generated, and Category Percent of Total Commercial Waste Generation

Employment Category	Generation Factor Tons/Employee/Year	New York City 2002 Tons Generated	% of Commercial Waste Generation
Construction	0.44	51,400	1.6%
Finance & Insurance	0.44	146,770	4.5%
Real Estate Rental & Leasing	0.44	51,570	1.6%
Manufacturing	1.40	199,410	6.2%
Wholesale Trade	1.20	172,160	5.3%
Retail Trade	2.50	724,410	22.4%
Transportation & Warehousing	0.74	79,520	2.5%
Utilities	0.56	8,640	0.3%
Information	0.65	109,650	3.4%
Professional, Technical & Scientific	0.65	188,190	5.8%
Management of Companies	0.65	37,110	1.1%
Administrative Support Services	0.65	128,240	4.0%
Health Care & Social Assistance	0.63	419,530	12.9%
Arts, Entertainment & Recreation	3.40	46,090	1.4%
Accommodation & Food Services	3.40	710,340	21.9%
Other Services[(1)]	0.65	92,190	2.9%
Unclassified & Other	0.65	13,080	0.4%
State & Federal Government[(2)]	0.44	61,950	1.9%
Total New York City[(3)]		3,240,250	100%

Notes:
(1) Except public administration.
(2) Except local government agencies.
(3) Numbers may not add due to rounding.

In July 2003, the New York Metropolitan Transportation Council (NYMTC) published an interim update of employment in the City accounting for the direct impacts of September 11, 2001. NYMTC is the only source of regional employment projections to 2024 and its data is used by many planning agencies in the New York region. However, the NYMTC data did not account for job loss at the census tract level, did not provide employment by industry sector and did not reflect job losses in the period 2000-2003 due to the economic recession. DSNY's Consultants made adjustments to the NYMTC data to develop a more accurate 2002 employment baseline for use in conjunction with waste generation factors. The additional adjustments included converting census tract employment data to employment estimates for the City's community districts (CD). Table 2.1.2-2 presents the employment data by business category.

The data in Tables 2.1.2-1 and 2.1.2-2 were used in the employment-based methodology to develop a year 2002 baseline estimate of 3,240,250 tons (10,385 tpd) of commercial putrescible waste generated, as reported in Table 1.4-2 of Volume II, Appendix B.

2.1.3 BIC-DSNY Carter Survey

In October and November of 2003 DSNY and BIC collaborated to conduct a survey of licensed carters in the City in order to collect data on City putrescible waste collection operations during the first six months of 2003. The waste quantity data was then doubled to approximate waste generated on an annual basis. The survey also developed information on the origin of commercial putrescible waste by borough, and on the destinations where collection vehicles tipped their loads. This borough-of-origin data was used as a basis for allocating the 2003 baseline waste generation estimate to the borough level. The survey methodology and results are reported in detail in Volume II, Appendix C of this Study.

Table 2.1.2-2
Annual Employment in New York City by Borough and by Employment Category, 2002
(Number of Employees)

Employment Category	Bronx	Brooklyn	Manhattan	Queens	Staten Island	Total Employees
Construction	10,508	23,043	32,976	44,442	7,021	117,990
Finance & Insurance	3,291	15,014	302,617	13,459	2,536	336,917
Real Estate Rental & Leasing	10,838	14,444	75,962	15,573	1,573	118,390
Manufacturing	9,948	36,267	53,423	41,115	1,357	142,110
Wholesale Trade	10,313	22,774	87,617	24,882	1,463	147,049
Retail Trade	24,643	57,234	136,564	53,016	15,974	287,431
Transportation & Warehousing	4,817	14,369	26,894	56,716	4,550	107,346
Utilities	1,723	4,475	6,197	2,471	653	15,519
Information	4,395	8,014	143,400	10,391	2,616	168,816
Professional, Technical & Scientific	3,272	12,069	259,690	10,994	3,701	289,726
Management of Companies	962	1,207	52,267	1,798	905	57,139
Administrative Support Services	8,568	18,702	141,321	25,045	3,798	197,434
Health Care & Social Assistance	73,025	135,965	204,429	92,813	26,370	532,602
Arts, Entertainment & Recreation	2,823	3,211	47,671	4,233	1,118	59,056
Accommodation & Food Services	10,629	18,465	144,621	29,842	6,117	209,674
Other Services[(1)]	8,120	21,241	87,204	21,779	3,586	141,930
Unclassified & Other	1,384	5,018	8,325	4,587	823	20,137
State & Federal Government[(2)]	14,257	20,565	81,952	20,283	5,163	142,220
Total	**203,516**	**432,077**	**1,893,130**	**473,439**	**89,324**	**3,091,486**

Notes:
(1) Except public administration.
(2) Except local government agencies.

A two-step approach was used to implement the survey:

1. All haulers received a survey form by fax, with a cover letter, describing the purpose of the survey and imposing a three-day deadline for faxing back the requested data. The data requested from each carter included: (i) the amount of waste disposed and recycled by month; and (ii) the transfer stations or disposal sites where waste disposed was tipped, indicating the name, address, and the quantities disposed at each site.

2. The information on the survey form was then corroborated and supplemented through a follow-up, in-person or telephone interview with the carting firm. The information gathered during these interviews included the number of truck shifts operated by the carter in each borough, the number of truckloads of refuse or recyclables picked up per shift, the types and sizes of vehicles used to pick up the refuse and recyclables, and a listing of customers by borough. In-person field visits for on-site data collection were restricted to large firms, defined as those carters with more than 10 trucks; the remaining firms were contacted by telephone. Interview data were collected from 124 carting firms.

2.2 Non-Putrescible and Fill Waste

The private non-putrescible Transfer Stations in the City are required to provide quarterly reports to the DSNY on the quantities of materials received, processed, recycled and disposed. In 2003, four (4) of these Transfer Stations did not use scales to weigh inbound loads; their reports list cubic yards received, which are converted to tons using density factors for various materials. Mixed C&D debris is converted to tons at a density of 1,500 pounds per cubic yard.[4] Source-separated recyclables are converted at a density of 500 pounds per cubic yard. Most loads of single material fill (road building material, gravel, dirt, rocks, asphalt and concrete) are converted at densities of approximately 2,200 pounds per cubic yard. In 2000, approximately 49% of the materials received by non-putrescible Transfer Stations was weighed. By early 2003, approximately 60% of C&D handled by non-putrescible Transfer Stations was weighed.

There were 20 fill material Transfer Stations licensed by the DSNY in early 2003. None of these stations weighs incoming or outgoing debris. All incoming and outgoing materials are converted to tons either by the Transfer Station itself or by the DSNY, using the density factors for various materials referred to above.

[4] This is the density factor for mixed C&D debris, including fill, provided by NYSDEC.

It appears, however, that the density conversions utilized when scale-weights are not available tend to overestimate the quantities of non–putrescible waste and underestimate fill debris. However, when aggregated, they appear to be reasonably accurate. Thus, baseline quantities of C&D debris for the year 2003 are determined from DSNY densities, as 8,640,840 tons, or 27,695 tpd.

In order to project quantities through the New SWMP Planning Period, it is necessary to relate C&D generation to the quantity of construction activity in the City.

2.2.1 Residential and Commercial Building-Related C&D Estimate

A literature search was performed to determine average C&D generation per square foot of: (1) residential construction; (2) residential demolition; and (3) residential renovation. Data from F.W. Dodge regarding the square footage of residential and commercial building construction, demolition and renovation are projected forward and multiplied by a tonnage generation factor (pounds of C&D per square foot) to obtain an estimate of building-related C&D debris. This type of C&D debris is projected forward.

2.2.2 Non-Building-Related C&D Estimate

Non-building debris includes waste materials generated during the process of constructing, demolishing and renovating bridges, streets and other projects that don't involve buildings, per se. Non-building-related C&D debris is estimated by subtracting building-related C&D debris from the estimated total for the City in 2003 (8,640,840). This total is related to the value of non-building construction, provided for the City by F.W. Dodge, and projected forward.

2.2.3 Fill Material and Non-Putrescible C&D Debris Estimate

The building-related and non-building-related quantities are summed, and presented as the C&D projection for the City. In order to allocate this total into the same material categories used by DSNY (non putrescibles and clean fill), a range of 60 to 70% of this total is classified as clean fill, and a range of 30 to 40% is classified as non-putrescible debris.

3.0 PUTRESCIBLE WASTE DISPOSED AND RECYCLED - BASELINE ESTIMATES

3.1 Year 2002 Estimates

Table 3.1-1 presents the estimates of the commercial putrescible waste generation for the year 2002 from the facilities estimate and the employment-based estimate. The methodology for the facilities estimate involved a survey of out-of-City disposal and transfer facilities and recyclables processors. In this table, the quantities of waste and recyclable materials these facilities received directly from the City carters were added to the DSNY (in-City) Quarterly Reports. The methodology for the employment-based estimate used factors that were developed for the generation of commercial wastes in tons per employee per year. These factors were multiplied by the number of employees in the City within any given sector (e.g., food service, finance, health care) to obtain generation of commercial waste.

3.2 Year 2003 Estimates and Year 2003 Baseline

Table 3.2-1 shows the results of the BIC-DSNY carter survey of commercial putrescible carting companies, and data from the DSNY Quarterly Reports.

The only source of 2003 data for waste tipped out of the City is the fax-back responses from the carter survey that reported tonnages delivered to specific transfer stations or disposal facilities located out of the City. In 2003, this direct export of waste amounted to 1,039 tpd – a significant increase from the 188 tpd directly exported in 2000.

Table 3.2-1 also displays the results of follow-up carter interviews with all the licensed carters operating in the City. The carter interviews yielded a different estimate of waste disposed and waste recycled than the fax-back responses. The carter interview estimates were derived from information developed on each carter's fleet operations, including truckloads of waste tipped per week, and the average weights of each truckload.

Table 3.1-1
2002 Estimated Commercial Putrescible Waste – Disposed and Recycled

Material/Destination	Data Sources [1]					
	Facility		Employment		Average [2]	
	TPY	TPD	TPY	TPD	TPY	TPD
Waste Disposed						
First tipped in City	2,006,316	6,431	N/A	N/A	N/A	N/A
Direct hauled out of City	266,642	855	N/A	N/A	N/A	N/A
Subtotal	2,272,958	7,285	2,253,380	7,222	2,263,169	7,254
Waste Recycled						
First tipped in City	890,565	2,854	N/A	N/A	N/A	N/A
Direct hauled out of City	132,154	424	N/A	N/A	N/A	N/A
Subtotal	1,022,719	3,278	986,870	3,163	1,004,795	3,221
Total Generation (Disposed & Recycled)	3,295,677	10,563	3,240,250	10,385	3,267,964	10,474
Recycling Percentage (Waste Recycled/Total Generation)	31%		30%		31%	

Notes:

(1) Data Sources:

a) Facility data combines data from DSNY Quarterly Transfer Station Reports for putrescible waste disposed in-City, and in-person and phone interviews with out-of-City waste transfer stations, other disposal facilities and recyclables processors, brokers and exporters.

b) Employment-based estimate was developed based on City employment for year 2002 and waste and recyclables generation factors for specific types of employment, based on waste generation studies conducted in large cities. The underlying employment estimate for 2002 reflects a net loss of 241,500 jobs in the City between 2000 and 2002 from the combined effect of 9/11 and the recession, according to the City comptroller's office.

(2) Straight average of facilities and employment estimates.

TPY = Tons per Year.

TPD = Tons per Day.

Table 3.2-1
2003 Estimates of Putrescible Solid Waste – Disposed and Recycled

Material/Destination	Data Sources[1]						2003 Estimate	
	Carter Survey Fax-Back[2]		Carter Survey Interviews on Fleet Operations		DSNY Quarterly Reports			
	TPY	TPD	TPY	TPD	TPY	TPD	TPY	TPD
Waste Disposed								
First tipped in City	1,779,447	5,703	N/A	N/A	1,937,208	6,209	N/A	N/A
Direct hauled out of City	324,148	1,039	N/A	N/A	324,147	1,039[2]	N/A	N/A
Subtotal	2,103,595	6,742	2,244,318	7,193	2,261,355	7,248	2,261,355	7,248
Waste Recycled								
First tipped in City	428,655	1,374	N/A	N/A	N/A	N/A	N/A	N/A
Direct hauled out of City	277,370	889	N/A	N/A	N/A	N/A	N/A	N/A
Subtotal[3]	706,025	2,263	810,133	2,597	N/A	N/A	758,079	2,430
Additional recycling at Transfer [4]	35,037	112	35,037	112			35,037	112
Deposit containers[5]	31,000	99	31,000	99			31,000	99
Total Recycling	772,062	2,475	876,170	2,808			824,116	2,641
Total Generation (Disposed & Recycled	2,875,657	9,217	3,120,488	10,001	N/A	N/A	3,085,000	9,889
Recycling Percentage (Waste Recycled/Total Generation)	27%		28%		NA		27%	

Notes:

(1) Data Sources:
- a) Fax-back data are forms returned by carters in response to BIC-DSNY survey. Returns represented 100% compliance.
- b) Carter survey interviews on fleet operations data were derived from follow-up in-person or phone interviews with carters responding to fax-back to clarify data anomalies and to develop information on fleet operations as an alternative basis for estimating waste quantities from fleet operations, i.e., truck shifts.
- c) Data summarized from the average of the first three Quarterly Reports filed by in-City putrescible Transfer Stations with DSNY. The 1,039 tpd disposed of out-of-City is carried over from carter survey fax-back to include out-of-City disposal in estimate.

(2) The fax-back response is the only source of data for determining 2003 out-of-City disposal. Note that quantity is consistent with upward trend from 2002 facilities estimate.

(3) Waste recycled (first tipped in-City and direct hauled out-of-City) represents an average of carter survey fax-back and interview data.

(4) Additional recycling separated at Transfer Stations from mixed loads.

(5) Deposit container estimate developed from data obtained from the facilities survey, published market consumption data and NYSDEC deposit statistics.

TPY = Tons per Year.

TPD = Tons per Day.

The data from these two sources (the fax-back data on tons tipped and the carter interviews) show similar results; the fax-back estimates for waste disposed are 6,742 tpd, while the carter interviews derived an estimate of 7,193 tpd – a difference of less than 7%. The estimated quantity of waste recycled is 2,263 tpd from the fax-back responses and 2,597 tpd from the carter interview data – a difference of 15%.

Additional recycling from the commercial sector includes recycling of materials at Transfer Stations from mixed waste loads. This amounted to 35,037 tons in 2003. An additional 31,000 tons of bottles and containers are recycled through the deposit program. In the aggregate, commercial recycling was 824,116 tons in 2003, or 2,641 tpd. The commercial recycling rate was approximately 27%, or 824,116 tons recycled out of approximately 3,085,000 tons generated in 2003. Overall, the quantity of commercial putrescible solid waste disposed in 2003 is estimated to be 2,261,355 tons (7,248 tpd), while 824,116 tons (2,641 tpd) are estimated to be recycled in 2003, for a total generation of 9,889 tpd.

3.3 Reconciliation of Preliminary Report Data

Table 3.3-1 presents data from the Preliminary Report and compares the results to the 2003 BIC-DSNY survey of commercial collection firms.

As shown in the table, the Preliminary Report data are adjusted to be consistent with the definitions of commercial putrescible waste utilized in the BIC-DSNY carter survey. The Preliminary Report included all materials collected by licensed putrescible carters, whereas the carter survey excluded non-putrescible materials collected by licensed putrescible collection firms. Putrescible materials delivered by self-haulers were removed from the Preliminary Report data, as these materials were not included in the BIC-DSNY carter survey. Materials collected from customers located outside the boundaries of the City were also subtracted from the Preliminary Report data; these materials were not included even if they were collected by firms licensed to collect putrescible waste within the City.

Table 3.3-1
Comparison of 2000 Preliminary Report to
2003 Transfer Station Quarterly Reports/BIC-DSNY Survey[1]

	2000 Preliminary Report			2000 Preliminary Report Adjusted	2003 DSNY Transfer Station Quarterly Reports – Out of City from BIC-DSNY Carter Survey
	Reported Disposed (TPD)	Adjustment Amount (TPD)	Reason[2]	Net Amount Disposed (TPD)	Net Amount Disposed (TPD)
In-City Transfer Stations	8,257	-209	Out-of-City Origins	8,048	6,209
Direct Export	514	-326	304 tpd of NP[3] 22 tpd of P[4]	188	1,039
Direct In-City Disposal[5]	644	-638	175 tpd of NP[3] 463 tpd of P[4]	6	
Excess[5]	576	-437	306 tpd of NP[3] 131 tpd of P[4]	139	
Total	**9,991**	**-1,609**		**8,381**	**7,248**

Notes:

(1) Input waste defined according to permit of either carter or Transfer Station (e.g., all waste to putrescible Transfer Station was defined as putrescible). Output waste defined according to type of waste recorded by survey. Table cannot be 100% reconciled with report because it attempts to merge both input and output information.

(2) Backup Table in Attachment 1 details the adjustments made by carter.

(3) Non-putrescible (NP) tonnage carried by putrescible (P) carters and/or destined for putrescible Transfer Stations was included in putrescible total, as part of tonnage being handled by the putrescible infrastructure. This category totals approximately 785 tpd.

(4) Some putrescible tonnage is taken out either because the BIC-DSNY survey did not include the category (e.g., self-haulers), or because classification of survey responses was judged to be incorrect (e.g., Filco Carting loads were classified as disposed rather than recycled tonnage.).

(5) Some of the Transfer Station excess was shifted to in-City direct disposal.

The net result of these adjustments is removal of 1,609 tpd from the results reported in the Preliminary Report, which had reported 9,991 daily tons of commercial putrescible waste disposed. The revised Preliminary Report total is 8,381 tpd. Of this quantity of waste, 188 tpd were exported directly to disposal facilities or transfer stations located outside of the City in the year 2000.

It is this adjusted figure of 8,381 tpd of commercial putrescible solid waste that can be accurately compared to the 2003 total net amount disposed of 7,248 (see Table 3.3-1). This table shows that between years 2000 and 2003, the commercial putrescible waste stream in the City decreased by approximately 13.5%. This decrease is attributable to decreases in employment which occurred over this interval as the economy entered into a recession, and to the after-effects of 9/11.

Taking into account the 2002 data, the trend in commercial putrescible waste disposed is 8,381 tpd in 2000, declining to 7,254 tpd in 2002 and decreasing slightly to 7,248 tpd in 2003. Because there is some inherent error in the different estimating methodologies used, these estimates should be interpreted as approximations. However, the consistency of the estimates, considering the external factors that would cause commercial waste generation to decline over this time, provides a degree of confidence that these estimates are reasonable.

3.4 Waste Origins and Destinations

The BIC-DSNY carter survey provided information on the origin and destination of commercial putrescible waste generated at the borough level. These data are presented in Table 3.4-1. Manhattan, which has the highest proportion of employment of the five boroughs, produces 41% of the waste disposed and accounts for 45% of the waste recycled. Brooklyn and Queens account for about equal quantities of waste disposed – 19% for Brooklyn and 20% for Queens; each of these boroughs accounts for 21% of waste recycled. Bronx discards 14% of the waste disposed and accounts for 9% of waste recycled. Staten Island discards 6% of the waste disposed and accounts for 3% of waste recycled.

Table 3.4-1
Origins and Destinations of Putrescible Waste, 2003

	Commercial Putrescible Waste					
	Waste Disposed		Waste Recycled		Total Generation	
	Tons/Day	% of Total	Tons/Day	% of Total	Tons/Day	% of Total
ORIGINS						
Manhattan	2,970	41%	1,178	45%	4,147	42%
Brooklyn	1,349	19%	553	21%	1,902	19%
Bronx	1,019	14%	240	9%	1,259	13%
Queens	1,419	20%	555	21%	1,974	20%
Staten Island	436	6%	71	3%	507	5%
New York City	7,193	100%	2,597	100%	9,790	100%
DESTINATIONS						
Manhattan	0	0%	0	0%	0	0%
Brooklyn	2,341	35%	678	30%	3,019	34%
Bronx	2,467	37%	219	10%	2,686	30%
Queens	896	13%	246	11%	1,142	13%
Staten Island	0	0%	231	10%	231	3%
New York City	5,703	85%	1,374	61%	7,077	79%
Out-of-City:						
Long Island	95	1%	66	3%	162	2%
Westchester	26	0%	2	0%	27	0%
New Jersey	878	13%	821	36%	1,699	19%
Other	40	1%	0	0%	40	1%
Total Out-of-City	1,039	15%	889	39%	1,928	21%
Grand Total	6,742	100%	2,263	100%	9,005	100%
Percent difference [(1)]	6.69%		14.75%		8.71%	

Notes:

(1) The difference is due to the differences in data sources: the data source for the Origins is BIC-DSNY carter survey interviews on fleet operations, and the data source for the Destinations is the BIC-DSNY carter survey Fax-Back response.

Origins = BIC-DSNY carter survey interviews – fleet operations

Destinations = BIC-DSNY carter survey – fax-back

Eighty-five percent (85%) of the City's waste disposed is initially transferred within the City; 15% is directly exported to nearby facilities in neighboring states or counties. Recycled waste is more likely to be exported directly -- 39% of this waste is directly exported out of the City.

These origin and destination estimates are used in conjunction with the employment-based estimate, as a basis for allocating the total waste generated to the City's boroughs and then forecasting waste generation over the New SWMP Planning Period.

3.5 Direct Export

Table 3.5-1 presents more detailed information on the destinations of the tons of waste disposed that were directly exported in 2002 and 2003.

Destinations are grouped by area: Western New Jersey, Newark, Staten Island Area, North Metro Area, Southern New Jersey, New York State, and Other Locations. The 2002 facilities estimate shows 855 tpd were directly exported, while the 2003 fax-back survey indicates 1,039 tpd. The increase in directly exported waste is consistent with anecdotal comments made during interviews with carters, who frequently mentioned that increases in tip fees at Transfer Stations in the City had made it economically beneficial to tip outside the City. In terms of where the directly exported waste is tipped, the most frequently used facilities are located in western New Jersey, where about two-thirds of the directly exported waste was tipped in 2002 and about one-half was tipped in 2003. The next most common locations for direct export of waste are those facilities located in or near Newark, New Jersey.

3.6 Distribution by Borough of Customers, Waste Disposed and Recycled

Table 3.6-1 summarizes the distribution of customers, waste disposed and waste recycled by borough.

Table 3.5-1
Direct Export - 2002 and 2003 Comparison

Carter Survey Fax-Back Out-of-City Disposal Sites		Tons per Year		Tons per Day	
		Facilities Estimate	Carter Survey Faxback	Facilities Estimate	Carter Survey Faxback
Name From Fax-Back Form	State	Tons 2002	Jan-Dec 2003	Tons 2002	Jan-Dec 2003
WESTERN NEW JERSEY GROUP					
Covanta, Warren County	NJ				
Warren County Landfill, Union, NJ	NJ				
PCFA, Oxford, NJ	NJ				
Waste Management Hunterdon County, NJ	NJ				
BFI, Fairview, NJ	NJ				
Bridgewater Resources, Somerset	NJ				
Union County Disposal, Union County, NJ	NJ				
Subtotal		**187,852**	**144,013**	**602**	**462**
NEWARK FACILITIES					
Recycling & Salvage, Newark, NJ	NJ				
American Refuel, Newark, NJ	NJ				
Hi Tech, Newark, NJ	NJ				
DJM South Kearny, NJ	NJ				
NJMC, Arlington, NJ	NJ				
Subtotal		**10,287**	**51,935**	**33**	**166**
STATEN ISLAND AREA					
Automated Modular Systems, Linden, NJ	NJ				
Waste Management Julia St, Elizabeth	NJ				
SWTR, Elizabeth, NJ	NJ				
Subtotal		**58,700**	**51,389**	**188**	**165**
NORTH METRO AREA					
Onyx, Totowa, NJ	NJ				
Garafola Transfer Station, Garfield, NJ	NJ				
Waste Management of NJ, Fairlawn NJ	NJ				
Allegro Sanitation, Secaucus, NJ	NJ				
Subtotal		**0**	**4,794**	**0**	**15**
SOUTHERN NEW JERSEY					
Midco, New Brunswick, NJ	NJ				
Camden County	NJ				
Woodhur Ltd, Wrightstown, NJ	NJ				
Subtotal		**7,403**	**21,868**	**24**	**70**
NEW YORK STATE					
American Refuel, Westbury, NY	NY				
Capital Compost, Menands, NY	NY				
Town of North Hempstead	NY				
Waste Management, Yonkers, NY	NY				
BFI Suburban, Westchester, NY	NY				
Sanitary District #1, Lawrence, NY	NY				
A1 Compaction, Yonkers, NY	NY				
Winter Brothers, West Babylon, NY	NY				
RIC, Mamaroneck, NY	NY				
Wheelabrator Westchester, Peekskill, NY	NY				
Subtotal		**1,200**	**39,782**	**4**	**128**
OTHER LOCATIONS					
Better Management Corp. of Ohio	OH				
American Ref Fuel, Chester, PA	PA				
Subtotal		**1,200**	**10,366**	**4**	**33**
Facilities Not in Fax-Back Form					
Pen Pac Fulton	NJ				
Onyx Robros	NJ				
		266,642	**324,147**	**855**	**1,039**

Table 3.6-1
Number of Carter Customers by Borough

	Manhattan	Brooklyn	Bronx	Queens	Staten Island	Total
Number of Customers	44,116	34,043	12,649	23,093	4,270	118,171
Percent of Total Customers	37.33%	28.81%	10.70%	19.54%	3.61%	100%
Percent of Total Waste Disposed	41.3%	18.8%	14.2%	19.7%	6.1%	100%
Percent of Total Recycled	45.4%	21.3%	9.3%	21.4%	2.7%	100%

3.7 Commercial Waste Generation Forecast

Commercial waste generation projections were developed for the New SWMP Planning Period. The projections were based upon three underlying assumptions:

- Waste generation, on a per employee basis, remains at 2003 levels for each borough;
- Waste generation, on a per employee basis, remains constant across the CDs within each borough, and
- The percentage of waste recycled, by borough, remains at 2003 levels.

In order to project commercial waste generation, the 2003 BIC-DSNY generation estimate was applied to the City employment forecast data, since City job growth or loss will directly affect future waste generation.

Revised NYMTC employment projections, which took into account the effects of September 11, were utilized as the basis of the projections. These projections were revised to reflect the downturn in the economy due to the economic recession in the City, and data were translated from the census tract level to the CD level.

Borough-wide waste generation factors were developed based upon the numbers generated in the BIC-DSNY survey and the number of employees in each borough in 2003. Borough-wide waste generation rates utilized were assumed to be the same throughout all CDs within each borough. The borough-wide rates are as follows:

- Bronx: 1.95 tons/employee-year;
- Brooklyn: 1.38 tons/employee-year;
- Manhattan: 0.677 tons/employee-year;
- Queens: 1.31 tons/employee-year; and
- Staten Island: 1.78 tons/employee-year.

The percentages of materials recycled were developed from the fax-back surveys, were developed at the borough level and were assumed to remain constant through 2024. The quantity of waste generated, recycled and disposed through the year 2024 is shown in Table 3.7-1.

Table 3.7-1
New York City Estimated Commercial Putrescible Waste Generation, Recycling and Disposal, 2003 through 2024

New York City	2003 (tons)	2005 (tons)	2010 (tons)	2015 (tons)	2020 (tons)	2024 (tons)
Generation	3,086,000	3,145,000	3,214,000	3,275,000	3,358,000	3,414,000
Recycling	824,000	840,000	858,000	874,000	895,000	909,000
Disposal	2,262,000	2,305,000	2,356,000	2,401,000	2,463,000	2,505,000

Table 3.7-2 shows the generation of commercial putrescible waste by borough, through the year 2024.

Table 3.7-2
Generation of Commercial Putrescible Waste by Borough, 2003 through 2024[(1)(2)]

	2003 (tons)	2005 (tons)	2010 (tons)	2015 (tons)	2020 (tons)	2024 (tons)
Bronx	398,000	400,000	413,000	424,000	443,000	458,000
Brooklyn	599,000	602,000	611,000	619,000	633,000	640,000
Manhattan	1,306,000	1,355,000	1,380,000	1,406,000	1,429,000	1,446,000
Queens	623,000	627,000	642,000	653,000	673,000	687,000
Staten Island	160,000	161,000	168,000	173,000	180,000	183,000
Total (tons/yr)	3,086,000	3,145,000	3,214,000	3,275,000	3,358,000	3,414,000

Notes:
(1) 2003 derived by multiplying generation quantities (Volume II, Appendix D, Table 1.5-1) by borough of origin (Volume II, Appendix D, Table 1.5-2). 2005 through 2024 derived from employment generation factors.
(2) Numbers may not add due to rounding.

Table 3.7-3 shows the quantity of commercial putrescible waste recycled, and Table 3.7-4 shows the quantity disposed by borough through the year 2024.

Table 3.7-3
Recycling of Commercial Putrescible Waste by Borough, 2003 through 2024[(1)(2)]

	2003 (tons)	2005 (tons)	2010 (tons)	2015 (tons)	2020 (tons)	2024 (tons)
Bronx	77,000	77,000	80,000	82,000	86,000	89,000
Brooklyn	175,000	176,000	179,000	181,000	185,000	187,000
Manhattan	373,000	387,000	394,000	402,000	408,000	413,000
Queens	176,000	177,000	181,000	184,000	190,000	194,000
Staten Island	23,000	23,000	24,000	25,000	26,000	26,000
Total (tons/yr)	824,000	840,000	858,000	874,000	895,000	909,000

Notes:
(1) Derived by multiplying generation quantities (Volume II, Appendix D, Table 1.5-3) by borough estimated recycling rate (Volume II, Appendix D, Table 1.5-4).
(2) Numbers may not add due to rounding.

Table 3.7-4
Disposal of Commercial Putrescible Waste by Borough, 2003 through 2024[(1)(2)]

	2003 (tons)	2005 (tons)	2010 (tons)	2015 (tons)	2020 (tons)	2024 (tons)
Bronx	321,000	323,000	333,000	342,000	357,000	369,000
Brooklyn	424,000	426,000	432,000	438,000	448,000	453,000
Manhattan	933,000	968,000	986,000	1,004,000	1,021,000	1,033,000
Queens	447,000	450,000	461,000	469,000	483,000	493,000
Staten Island	137,000	138,000	144,000	148,000	154,000	157,000
Total (tons/yr)	2,262,000	2,305,000	2,356,000	2,401,000	2,463,000	2,505,000

Notes:
(1) Derived by subtracting recycling quantities (Volume II, Appendix D, Table 1.5-5) from generation quantities (Volume II, Appendix D, Table 1.5-3).
(2) Numbers may not add due to rounding.

4.0 COMMERCIAL NON-PUTRESCIBLE WASTE

Volume II, Appendix E of this Study describes the means of projecting the generation of commercial non-putrescible waste. It should be noted that waste generated during residential construction, demolition and renovation is not considered DSNY-managed Waste, and hence is part of the commercial waste stream collected by the private carters.

4.1 Total Tons of C&D Debris

Table 4.1-1 presents the DSNY-reported quantities of clean fill and non-putrescible C&D waste, which together equal the total quantity of C&D debris in the City, for the years 2000, 2001, 2002 and 2003. C&D ranged from 6.35 million tons in 2000 to 7.91 million tons in 2002. For 2003, total tons are estimated at 8.64 million by utilizing data from the first three quarters of 2003, and assuming that the 4th quarter would average 100% of the 3rd quarter for fill, and 90% of the 3rd quarter for C&D. Average daily tonnage is in the 20,000 to 27,000 range, and has increased steadily over these four years. It is not known if the trend will continue to rise, or if tonnages will, over time, revert to quantities more typical of the year 2000. The average of the three years for which complete data is available is just under 7 million tons. As shown by the table, on average, clean fill represented approximately 60% of the total amount of C&D for the years 2000 through 2002, and non-putrescible C&D represented the remaining 40%. However, as shown by the 2003 data, clean fill appears to be accounting for an ever larger percentage of C&D debris, totaling almost 70%. Therefore, in allocating the total quantity of C&D waste into non-putrescible and clean fill components, a range was derived, with clean fill constituting between 60% and 70% of the total material, and C&D constituting between 30% and 40% of the total.

Table 4.1-1

Total Quantity of C&D in New York City

Item	Year			Average	2003[2]
	2000	2001	2002		
Tons per day input[1]					
Non-Putrescible C&D	9,475	9,735	8,610	9,274	8,626
Clean Fill C&D	10,891	11,706	16,729	13,109	19,069
Total C&D	20,366	21,441	25,340	22,382	27,695
Tons per year input					
Non-Putrescible C&D	2,956,200	3,037,398	2,686,398	2,893,332	2,691,390
Clean Fill C&D	3,398,070	3,652,194	5,219,526	4,089,930	5,949,450
Total C&D	6,354,270	6,689,592	7,905,924	6,983,262	8,640,840
Clean fill as percent of Total C&D	53.5%	54.6%	66.0%	58.6%	68.9%

Notes:

(1) Based upon 312 days per year of operation.

(2) 2003 consists of first three quarters, plus fourth quarter estimated at 90% of third quarter for non-putrescible and 100% of third quarter tonnages for fill material.

4.2 Residential Construction, Demolition and Renovation Debris

An average waste generation rate of 4.10 pounds per square foot was utilized for determining the quantity of residential construction waste generated from single-family residences, as typically found in Staten Island. For multi-family construction, a residential construction waste generation factor of 3.99 pounds per square foot was utilized, and a weighted average of 4.02 pounds per square foot was applied to residential construction waste generation throughout the City. New residential building construction debris estimates are shown in Table 4.2-1. It is important to note that the construction industry exhibits cyclic behavior, related to economic cycles within a region. Therefore, this table illustrates the general trend in the increase in residential construction waste generated within this sector, but may not be a good indicator of new residential construction waste generated in a given year in the future.

For single-family buildings, an average waste generation rate of 85.10 pounds per square foot demolished was utilized; 50.50 pounds per square foot was used for multi-family housing. New construction within the City generally requires the demolition of existing buildings, so the waste generated mirrors the trend in the generation of construction debris. Projections of residential demolition debris are shown on Table 4.2-1.

An average residential debris generation factor of 27.3 pounds per square foot of residential renovation was utilized and applied to the square footage of residential renovations, which was derived from information on the value of residential renovation obtained from F.W. Dodge. These projections are also shown in Table 4.2-1.

4.3 Commercial Construction, Demolition and Renovation Debris

Generation rates of 3.8, 130.3 and 11.3 pounds per square foot were utilized to estimate C&D from commercial construction, demolition and renovation, respectively. Square footages for each of these categories were projected into the future based upon data provided by F.W. Dodge, as well as a number of assumptions, as described in detail in Volume II, Appendix E of this Study. The total tonnage of commercial construction, demolition and renovation debris generated in the City is shown in Table 4.3-1.

4.4 Non-Building-Related C&D

Non-building debris includes waste materials generated in the process of constructing, demolishing and renovating public works projects such as gas and communications facilities, streets and highways, water supply systems and other non-building activities. Data on the constant dollar value of this construction in the City was obtained from F.W. Dodge, and projected forward through 2024. Aggregate non-building debris is estimated by subtracting the total of building-related C&D debris from the baseline total estimated above from DSNY non-putrescible and fill transfer station reports. The range of tonnage per thousand dollars of value of non-building construction in the years 2000 to 2002 and the year 2003 was used to generate an anticipated range of tonnage projections through 2024. These projections are shown in Table 4.4-1.

Table 4.2-1
Projected Residential Construction, Demolition and Renovation Debris for New York City, 1997-2024

Year	Residential Construction Debris in Tons	Residential Demolition Debris in Tons	Residential Building Renovation Debris in Tons	Total Residential Sector C&D Debris
1997	21,003	NA	NA	NA
1998	26,492	NA	NA	NA
1999	29,686	431,526	96,765	557,977
2000	31,952	467,262	64,865	564,079
2001	33,710	487,773	53,685	575,168
2002	35,146	471,105	42,397	548,648
2003	36,360	485,872	7,180	529,412
2004	37,412	518,212	14,524	570,148
2005	38,339	529,421	6,088	573,848
2006	39,169	515,098	11,029	565,296
2007	37,230	503,626	17,267	558,123
2008	37,915	512,223	18,673	568,811
2009	38,546	520,167	20,652	579,365
2010	39,130	527,549	23,178	589,857
2011	39,673	534,444	26,181	600,298
2012	40,181	540,913	29,621	610,715
2013	40,659	547,006	33,483	621,148
2014	41,109	552,765	37,729	631,603
2015	41,535	558,223	42,329	642,087
2016	41,939	563,410	47,297	652,646
2017	42,323	568,354	52,607	663,284
2018	42,689	573,074	58,231	673,994
2019	43,040	577,592	64,182	684,814
2020	43,375	581,922	70,434	695,731
2021	43,696	586,081	77,000	706,777
2022	44,005	590,082	83,866	717,953
2023	44,302	593,936	91,032	729,270
2024	44,589	597,653	98,485	740,727

Table 4.3-1
Projected Commercial Construction, Demolition and Renovation Debris in New York City, 1999-2024

Year	Commercial Construction (Tons)	Commercial Demolition (Tons)	Commercial Renovation (Tons)	Commercial Total (Tons)
1999	23,563	622,924	606,884	1,253,371
2000	24,149	709,347	606,425	1,339,921
2001	40,234	813,838	609,525	1,463,597
2002	28,670	654,580	607,879	1,291,129
2003	25,005	625,097	609,495	1,259,597
2004	26,409	650,021	611,273	1,287,703
2005	27,560	668,533	613,196	1,309,289
2006	28,255	674,335	615,244	1,317,834
2007	27,455	672,804	617,112	1,317,371
2008	28,118	689,057	619,025	1,336,200
2009	28,797	705,702	620,985	1,355,484
2010	29,493	722,750	622,992	1,375,235
2011	30,205	740,209	625,047	1,395,461
2012	30,935	758,089	627,152	1,416,176
2013	31,682	776,403	629,308	1,437,393
2014	32,447	795,158	631,516	1,459,121
2015	33,231	814,366	633,778	1,481,375
2016	34,034	834,039	636,094	1,504,167
2017	34,856	854,186	638,466	1,527,508
2018	35,698	874,820	640,895	1,551,413
2019	36,560	895,953	643,383	1,575,896
2020	37,444	917,596	645,931	1,600,971
2021	38,348	939,762	648,541	1,626,651
2022	39,285	962,464	651,213	1,652,962
2023	40,223	985,714	653,950	1,679,887
2024	41,195	1,009,525	656,754	1,707,474

Table 4.4-1
Projected Non-Building-Related Construction, Demolition and Renovation Debris in New York City, 2000-2024

Year	Value of Non-Building-Related Construction (000s of 1996 $)	Non-Building-Related C&D Debris[1] (1.96 * Value) (Tons)	Non-Building-Related C&D Debris (2.97 * Value) (Tons)
2000	$2,535,203	4,450,000	NA
2001	$2,079,637	4,651,000	NA
2002	$3,236,764	6,066,000	NA
2003	$2,306,670	NA	6,852,000
2004	$2,143,400	4,201,000	6,366,000
2005	$2,177,569	4,268,000	6,467,000
2006	$2,281,721	4,472,000	6,777,000
2007	$2,340,870	4,588,000	6,952,000
2008	$2,455,527	4,813,000	7,293,000
2009	$2,486,428	4,873,000	7,385,000
2010	$2,515,918	4,931,000	7,472,000
2011	$2,544,135	4,987,000	7,556,000
2012	$2,571,197	5,040,000	7,636,000
2013	$2,597,205	5,091,000	7,714,000
2014	$2,622,248	5,140,000	7,788,000
2015	$2,646,404	5,187,000	7,860,000
2016	$2,669,739	5,233,000	7,929,000
2017	$2,692,316	5,277,000	7,996,000
2018	$2,714,186	5,320,000	8,061,000
2019	$2,735,399	5,361,000	8,124,000
2020	$2,755,997	5,402,000	8,185,000
2021	$2,776,019	5,441,000	8,245,000
2022	$2,795,500	5,479,000	8,303,000
2023	$2,814,473	5,516,000	8,359,000
2024	$2,832,965	5,553,000	8,414,000

Notes:
[1] Utilized actual tons of non-building-related debris per $1,000 of expenditure for the years 2000 to 2002, from Volume II, Appendix E, Table 6.1.1-1.

The average value for the years 2000 to 2002 of the tons of non-building-related debris per $1,000 expended was approximately 1.96 tons. For the year 2003, the rate dramatically increases to 2.97 tons per $1,000 expended. The quantity of non-building-related C&D tons rises from 4,450,000 in 2000 to an estimated 6,852,000 tons in 2003. Both the lower and upper ranges, using the 1.96 and 2.97 factors, are utilized to project quantities of non-building-related C&D through the New SWMP Planning Period. By 2024, the quantity is expected to range from approximately 5.6 to 8.4 million tons.

Table 4.4-1 presents the dollar value of non-building-related construction, demolition and renovation in the City from 2000 to 2024. This table also contains the estimated range of tons of non-building-related C&D debris, which will be generated as a result of the predicted level of economic activity.

4.5 Total Estimated C&D Commercial Waste

Tables 4.5-1 and 4.5-2 disaggregate the total estimate for C&D debris into the fill material and non-putrescible categories used by the City in regulating its Transfer Stations, on a tons per year basis. In these tables, fill is shown as ranging from 60% to 70% of the total C&D, with the remainder allocated to the non-putrescible category. These tables utilize the 2003 baseline quantity of C&D material, and utilize the previously described methodology to project these quantities for the New SWMP Planning Period.

Non-putrescible material can be expected to range from 2.4 to 3.2 million tons utilizing the average data from 2000 to 2002, while fill material would range from 4.8 million to 5.6 million tons. By utilizing the higher factor of 2003, non-putrescible materials would range from 3.3 to 4.3 million tons, while fill material would range from 6.5 to 7.6 million tons in the year 2024. These percentages are likely to vary seasonally and annually, due to the highly variable nature of non-putrescible materials.

Table 4.5-1
Range of Quantities of Non-Putrescible and Fill Material, 2004-2024
(based upon average data for 2000-2002, in tons per year)

Year	Average (2000-2002) Estimate (Using 1.96)			
	Non-Putrescible		Fill	
	30%	40%	60%	70%
2004	1,728,000	2,304,000	3,455,000	4,031,000
2005	1,845,000	2,460,000	3,691,000	4,306,000
2006	1,907,000	2,542,000	3,813,000	4,449,000
2007	1,939,000	2,585,000	3,878,000	4,525,000
2008	2,015,000	2,687,000	4,031,000	4,702,000
2009	2,042,000	2,723,000	4,085,000	4,766,000
2010	2,069,000	2,759,000	4,138,000	4,827,000
2011	2,095,000	2,793,000	4,189,000	4,888,000
2012	2,120,000	2,827,000	4,240,000	4,947,000
2013	2,145,000	2,860,000	4,289,000	5,004,000
2014	2,169,000	2,892,000	4,338,000	5,061,000
2015	2,193,000	2,924,000	4,386,000	5,117,000
2016	2,217,000	2,956,000	4,434,000	5,173,000
2017	2,240,000	2,987,000	4,481,000	5,227,000
2018	2,264,000	3,018,000	4,527,000	5,282,000
2019	2,287,000	3,049,000	4,573,000	5,335,000
2020	2,310,000	3,079,000	4,619,000	5,389,000
2021	2,332,000	3,110,000	4,665,000	5,442,000
2022	2,355,000	3,140,000	4,710,000	5,495,000
2023	2,378,000	3,170,000	4,755,000	5,548,000
2024	2,400,000	3,200,000	4,800,000	5,601,000

Table 4.5-2
Range of Quantities of Non-Putrescible and Fill Material, 2004-2024
(based upon 2003 data, in tons per year)

Year	Upper Estimate (Using 2.97)			
	Non-Putrescible		Fill	
	30%	40%	60%	70%
2004	2,377,000	3,169,000	4,754,000	5,547,000
2005	2,505,000	3,340,000	5,010,000	5,845,000
2006	2,598,000	3,464,000	5,196,000	6,062,000
2007	2,648,000	3,531,000	5,297,000	6,180,000
2008	2,759,000	3,679,000	5,519,000	6,439,000
2009	2,796,000	3,728,000	5,592,000	6,524,000
2010	2,831,000	3,775,000	5,662,000	6,606,000
2011	2,866,000	3,821,000	5,731,000	6,686,000
2012	2,899,000	3,865,000	5,798,000	6,764,000
2013	2,932,000	3,909,000	5,863,000	6,841,000
2014	2,964,000	3,952,000	5,927,000	6,915,000
2015	2,995,000	3,993,000	5,990,000	6,988,000
2016	3,026,000	4,034,000	6,052,000	7,060,000
2017	3,056,000	4,075,000	6,112,000	7,131,000
2018	3,086,000	4,115,000	6,172,000	7,201,000
2019	3,115,000	4,154,000	6,231,000	7,269,000
2020	3,145,000	4,193,000	6,289,000	7,337,000
2021	3,173,000	4,231,000	6,347,000	7,405,000
2022	3,202,000	4,269,000	6,404,000	7,471,000
2023	3,230,000	4,307,000	6,461,000	7,538,000
2024	3,259,000	4,345,000	6,517,000	7,603,000

Attachment 1

Reconciliation Backup Details

Reconciliation Back-up Details: Direct In-City Disposal 2000 [1]

Facility Name	County	State	Annual Tonnage	Tons per Day	Carter License	Material	Reason for Omitting
Non-Putrescible Omitted							
CHAMBERS PAPER FIBRES CORP	BROOKLYN	NY	12,000	38	Carter: Putr.	N-Purtescible	paper
CHAMBERS PAPER FIBRES CORP	BROOKLYN	NY	12,000	38	Carter: Putr.	N-Purtescible	paper
CHAMBERS PAPER FIBRES CORP	BROOKLYN	NY	3,600	12	Carter: Putr.	N-Purtescible	paper
CHAMBERS PAPER FIBRES CORP	BROOKLYN	NY	100	0	Carter: Putr.	N-Purtescible	paper
SPRINT RECYCLING INC	NEW YORK	NY	1,482	5	Carter: Putr.	Mixed Paper	paper
SPRINT RECYCLING INC	NEW YORK	NY	4,943	16	Carter: Putr.	Mixed Paper	paper
SPRINT RECYCLING INC	NEW YORK	NY	2,466	8	Carter: Putr.	C & D	paper
BAVARO CARTING CORP	BROOKLYN	NY	501	2	Carter: Putr.	Corrugated Cardboard	recyclables
D&D CARTING CO	BROOKLYN	NY	208	1	Carter: Putr.	Corrugated Cardboard	recyclables
D&D CARTING CO	BROOKLYN	NY	599	2	Carter: Putr.	Mixed Paper	recyclables
D&D CARTING CO	BROOKLYN	NY	728	2	Carter: Putr.	Corrugated Cardboard	recyclables
DECOSTELLO CARTING	BROOKLYN	NY	520	2	Carter: Putr.	Mixed Paper	recyclables
DECOSTELLO CARTING	BROOKLYN	NY	520	2	Carter: Putr.	Mixed Paper	recyclables
FRANK LOMANGINO & SONS	NASSAU	NY	1,703	5	Carter: Putr.	Corrugated Cardboard	recyclables
J RUTICLIANO WASTE REMOVAL	NASSAU	NY	2,250	7	Carter: Putr.	Mixed Paper	recyclables
J RUTICLIANO WASTE REMOVAL	NASSAU	NY	1,550	5	Carter: Putr.	Corrugated Cardboard	recyclables
ATLAS SANITATION CO INC	QUEENS	NY	500	2	Carter: Putr.	Mixed Paper	recyclables
ATLAS SANITATION CO INC	QUEENS	NY	1,500	5	Carter: Putr.	Mixed Paper	recyclables
UNITED SANITATION INC	QUEENS	NY	11	0	Carter: Putr.	Corrugated Cardboard	recyclables
STAR RUBBISH REMOVAL	STATEN ISLAND	NY	1,560	5	Carter: Putr.	Corrugated Cardboard	recyclables
DYNAMIC RUBBISH REMOVAL	SUFFOLK	NY	1,463	5	Carter: Putr.	Mixed Recyclables	recyclables
TIA OF NEW YORK	SUFFOLK	NY	900	3	Carter: Putr.	Corrugated Cardboard	recyclables
TIA OF NEW YORK	SUFFOLK	NY	400	1	Carter: Putr.	Corrugated Cardboard	recyclables
CHINATOWN CARTING CORP	WESTCHESTER	NY	3,060	10	Carter: Putr.	Corrugated Cardboard	recyclables
Non-Putrescible Omitted:			54,564	175			
Putrescible Omitted							
RAGS CONTRACTING CORP	NASSAU	NY	65	0	Carter: Putr.	Putrescible MSW	C&D
ALLSTATE POWER VAC INC	UNION	NJ	7,210	23	Carter: Putr.	LIQUID/PUTRESCIBLE	Env. Remediation
ALLSTATE POWER VAC INC	UNION	NJ	518	2	Carter: Putr.	LIQUID/PUTRESCIBLE	Env. Remediation
ANTONIO ROTONDI LANDSCAPING	BROOKLYN	NY	11	0	Self Haulers: Putr.	Putrescible MSW	Greenwaste
ANTONIO ROTONDI LANDSCAPING	BROOKLYN	NY	34	0	Self Haulers: Putr.	Putrescible MSW	Greenwaste
GIUSEPPE COMMISSO GARDENER LANDSCAP	BROOKLYN	NY	336	1	Self Haulers: Putr.	Putrescible MSW	Greenwaste
THE GREENWOOD CEMETERY CORP.	BROOKLYN	NY	963	3	Self Haulers: Putr.	Putrescible MSW	Greenwaste
B & P SERVICES OF STATEN ISLAND INC	MONMOUTH	NJ	20	0	Self Haulers: Putr.	Putrescible MSW	Greenwaste
B & P SERVICES OF STATEN ISLAND INC	MONMOUTH	NJ	5	0	Self Haulers: Putr.	Grass, Landscape Material	Greenwaste
PRIME LANDSCAPE SERVICES	STATEN ISLAND	NY	400	1	Self Haulers: Putr.	Putrescible MSW	Greenwaste
PRIME LANDSCAPE SERVICES	STATEN ISLAND	NY	19	0	Self Haulers: Putr.	Putrescible MSW	Greenwaste
LA ROSA DOMINGO	QUEENS	NY	5	0	Carter: Putr.	LIQUID/PUTRESCIBLE	liquid
MC LAUGLIN & TERRI HARRIS	QUEENS	NY	234	1	Self Haulers: Putr.	Putrescible MSW	liquid
FILCO CARTING CORP.(ALSO CF WASTE PAPER CO.)	BROOKLYN	NY	48,027	154	Carter: Putr.	Putrescible MSW	paper
FILCO CARTING CORP.(ALSO CF WASTE PAPER CO.)	BROOKLYN	NY	86,449	277	Carter: Putr.	Putrescible MSW	paper
OUTSTANDING RENEWAL ENTERPRISES	NEW YORK	NY	130	0	Transfer Station: Putr.	Putrescible MSW	self haul
Putrescible Omitted:			144,426	463			
Putrescible Retained							
ARGENTO RUBBISH REMOVAL INC	BRONX	NY	512	2	Carter: Putr.	Putrescible MSW	
LA ROSA DOMINGO	QUEENS	NY	26	0	Carter: Putr.	Putrescible MSW	
UNITED SANITATION INC	QUEENS	NY	27	0	Carter: Putr.	Putrescible MSW	
SCOCOZZO CARTING CORP	STATEN ISLAND	NY	600	2	Carter: Putr.	Mixed Recyclables	
DYNAMIC RUBBISH REMOVAL	SUFFOLK	NY	736	2	Carter: Putr.	Putrescible MSW	
Putrescible Retained:			1,901	6			
TOTAL Direct In-City Disposal			200,891	644			

(1) Data extracted from 2000 Survey Forms

Reconciliation Back-up Details: Direct Export [1]

Facility Name	County	State	Annual Tonnage	Tons per Day	Carter License	Material	Reason for Omitting
Non-Putrescible Omitted							
JEM SANITATION CORP	BERGEN	NJ	960	3	Carter: Putr.	C & D	C&D
ACTION CARTING ENV SERVICES	ESSEX	NJ	158	1	Carter: Putr.	C & D	C&D
ACTION CARTING ENV SERVICES	ESSEX	NJ	1,280	4	Carter: Putr.	C & D	C&D
OMNI WASTE SERVICES INC	PASSAIC	NJ	2,408	8	Carter: Putr.	C & D	C&D
MAC HEALTH CARE SERVICES	UNION	NJ	213	1	Carter: Putr.	C & D	C&D
ALLSTATE POWER VAC INC	UNION	NJ	1,227	4	Carter: Putr.	Soil	env. Remediation
P.J.C. SANITATION SERVICE INC.	BROOKLYN	NY	720	2	Carter: Putr.	C & D	C&D
SPRINT RECYCLING INC	NEW YORK	NY	44,231	142	Carter: Putr.	Mixed Paper	recyclables
JEM SANITATION CORP	BERGEN	NJ	7,000	22	Carter: Putr.	Corrugated Cardboard	recyclables
JEM SANITATION CORP	BERGEN	NJ	18,000	58	Carter: Putr.	Mixed Recyclables	recyclables
JEM SANITATION CORP	BERGEN	NJ	2,000	6	Carter: Putr.	Mixed Recyclables	recyclables
JEM SANITATION CORP	BERGEN	NJ	2,000	6	Carter: Putr.	Corrugated Cardboard	recyclables
GOTHAM RECYCLING RESOURCES	ESSEX	NJ	7,242	23	Carter: Putr.	Mixed Paper	recyclables
M&M SANITATION CORP (POSSIBLY KNOWN	HUDSON	NJ	3,484	11	Carter: Putr.	Corrugated Cardboard	recyclables
RUSSELL REID WASTE HAULING AND DISP	MIDDLESEX	NJ	5	0	Carter: Putr.	Mixed Paper	recyclables
J RUTICLIANO WASTE REMOVAL	NASSAU	NY	900	3	Carter: Putr.	Corrugated Cardboard	recyclables
J RUTICLIANO WASTE REMOVAL	NASSAU	NY	2,700	9	Carter: Putr.	Mixed Paper	recyclables
MIDLAND CARTING CORP	NASSAU	NY	513	2	Carter: Putr.	Corrugated Cardboard	recyclables
Non-Putrescible Omitted			95,040	305			
Putrescible Omitted							
THE SALVATION ARMY	NEW YORK	NY	1,092	4	Self Haulers: Putr.	Putrescible MSW	self haul
ALLSTATE POWER VAC INC	UNION	NJ	16	0	Carter: Putr.	Putrescible MSW	env. Remediation
ALLSTATE POWER VAC INC	UNION	NJ	125	0	Carter: Putr.	LIQUID/PUTRESCIBLE	env. Remediation
ALLSTATE POWER VAC INC	UNION	NJ	1,174	4	Carter: Putr.	LIQUID/PUTRESCIBLE	env. Remediation
ALLSTATE POWER VAC INC	UNION	NJ	959	3	Carter: Putr.	LIQUID/PUTRESCIBLE	env. Remediation
ALLSTATE POWER VAC INC	UNION	NJ	669	2	Carter: Putr.	LIQUID/PUTRESCIBLE	env. Remediation
ALLSTATE POWER VAC INC	UNION	NJ	815	3	Carter: Putr.	LIQUID/PUTRESCIBLE	env. Remediation
ALLSTATE POWER VAC INC	UNION	NJ	1,416	5	Carter: Putr.	LIQUID/PUTRESCIBLE	env. Remediation
ALLSTATE POWER VAC INC	UNION	NJ	62	0	Carter: Putr.	LIQUID/PUTRESCIBLE	env. Remediation
RUSSELL REID WASTE HAULING AND DISP	MIDDLESEX	NJ	269	1	Carter: Putr.	LIQUID/PUTRESCIBLE	liquid
Putrescible Omitted:			6,597	21			
Putrescible Retained							
FALLETTA CARTING CORP	BROOKLYN	NY	1,052	3	Carter: Putr.	Putrescible MSW	
IDEAL SANITATION SERVICE	BERGEN	NJ	3,796	12	Carter: Putr.	Putrescible MSW	
JEM SANITATION CORP	BERGEN	NJ	13,730	44	Carter: Putr.	Putrescible MSW	
JOHN PASQUALE, INC.	BERGEN	NJ	1,352	4	Carter: Putr.	Putrescible MSW	
ACTION CARTING ENV SERVICES	ESSEX	NJ	3,709	12	Carter: Putr.	Putrescible MSW	
SPRINT RECYCLING INC	NEW YORK	NY	368	1	Carter: Putr.	Putrescible MSW	
CLASSIC RECYCLING NEW YORK, INC.	PASSAIC	NJ	6,871	22	Carter: Putr.	Putrescible MSW	
CLASSIC SANITATION CO., LTD.	PASSAIC	NJ	448	1	Carter: Putr.	Putrescible MSW	
OMNI WASTE SERVICES INC	PASSAIC	NJ	350	1	Carter: Putr.	Putrescible MSW	
CAPITOL CARTING CORP	QUEENS	NY	866	3	Carter: Putr.	Putrescible MSW	
MAC HEALTH CARE SERVICES	UNION	NJ	1,872	6	Carter: Putr.	Putrescible MSW	
FALLETTA CARTING CORP	BROOKLYN	NY	3,524	11	Carter: Putr.	Putrescible MSW	
RAGS CONTRACTING CORP	NASSAU	NY	501	2	Carter: Putr.	Putrescible MSW	
KEY CONTAINER SERVICE	QUEENS	NY	8,428	27	Carter: Putr.	Putrescible MSW	
CHAMBERS PAPER FIBRES CORP	BROOKLYN	NY	1,080	3	Carter: Putr.	Putrescible MSW	
CITY WASTE SERVICES OF NY	BRONX	NY	3,000	10	Carter: Putr.	Putrescible MSW	
GOTHAM RECYCLING RESOURCES	ESSEX	NJ	6,958	22	Carter: Putr.	Putrescible MSW	
BASIN HAULAGE INC	QUEENS	NY	10	0	Carter: Putr.	Putrescible MSW	
ROYAL WASTE SERVICES	QUEENS	NY	695	2	Carter: Putr.	Putrescible MSW	
Putrescible Retained:			58,611	188			
TOTAL DIRECT EXPORT			160,248	514			

(1) Data extracted from 2000 Survey Forms

Reconciliation Back-up Details: Excess [1]

Facility Name	County	State	Annual Tonnage	Tons per Day	Carter License	Material	Reason for Omitting
Non-Putrescible Omitted							
JEM SANITATION CORP	BERGEN	NJ	210	1	Carter: Putr.	C & D	C&D
LEO P IPPOLITO INC.	BERGEN	NJ	34	0	Carter: Putr.	C & D	C&D
LEO P IPPOLITO INC.	BERGEN	NJ	1,659	5	Carter: Putr.	C & D	C&D
J.F. DUFFY RUBBISH REMOVAL	BRONX	NY	596	2	Carter: Putr.	Wood, Wood Chips, Mulch	C&D
MID BRONX HAULAGE	BRONX	NY	10,469	34	Carter: Putr.	N-Purtescible	C&D
SANITATION SALVAGE CORP	BRONX	NY	520	2	Carter: Putr.	N-Purtescible	C&D
CANAL CARTING INC	BROOKLYN	NY	6,000	19	Carter: Putr.	N-Purtescible	C&D
CONSUMERS RUBBISH REMOVAL INC.	BROOKLYN	NY	83	0	Carter: Putr.	C & D	C&D
H ANDREANA CARTING	BROOKLYN	NY	1,760	6	Carter: Putr.	N-Purtescible	C&D
MULTI CARTING INC	BROOKLYN	NY	234	1	Carter: Putr.	N-Purtescible	C&D
MULTI CARTING INC	BROOKLYN	NY	234	1	Carter: Putr.	N-Purtescible	C&D
P.J.C. SANITATION SERVICE INC.	BROOKLYN	NY	2,100	7	Carter: Putr.	C & D	C&D
WATCHTOWER BIBLE & TRACT SOCIETY OF	BROOKLYN	NY	925	3	Self Haulers: Putr.	N-Purtescible	C&D
M&M SANITATION CORP (POSSIBLY KNOWN	HUDSON	NJ	3,873	12	Carter: Putr.	C & D	C&D
B & P SERVICES OF STATEN ISLAND INC	MONMOUTH	NJ	12	0	Self Haulers: Putr.	Fill	C&D
AJI INDUSTRIES	NASSAU	NY	34,335	110	Carter: Putr.	N-Purtescible	C&D
GREGOR CARTING CORP	NASSAU	NY	592	2	Carter: Putr.	N-Purtescible	C&D
GREGOR CARTING CORP	NASSAU	NY	811	3	Carter: Putr.	Wood, Wood Chips, Mulch	C&D
GREGOR CARTING CORP	NASSAU	NY	175	1	Carter: Putr.	Wood, Wood Chips, Mulch	C&D
GREGOR CARTING CORP	NASSAU	NY	1,059	3	Carter: Putr.	Wood, Wood Chips, Mulch	C&D
OMNI WASTE SERVICES INC	PASSAIC	NJ	394	1	Carter: Putr.	C & D	C&D
OMNI WASTE SERVICES INC	PASSAIC	NJ	847	3	Carter: Putr.	C & D	C&D
ATLAS SANITATION CO INC	QUEENS	NY	10,829	35	Carter: Putr.	C & D	C&D
BASIN HAULAGE INC	QUEENS	NY	3,967	13	Carter: Putr.	N-Purtescible	C&D
BESTWAY CARTING	QUEENS	NY	1,711	5	Carter: Putr.	N-Purtescible	C&D
BESTWAY CARTING	QUEENS	NY	6,902	22	Carter: Putr.	N-Purtescible	C&D
FOREST HILLS CONTAINER SERVICE	QUEENS	NY	691	2	Carter: Putr.	N-Purtescible	C&D
UNITED SANITATION INC	QUEENS	NY	185	1	Carter: Putr.	C & D	C&D
PARK RUBBISH REMOVAL	SUFFOLK	NY	110	0	Carter: Putr.	C & D	C&D
PARK RUBBISH REMOVAL	SUFFOLK	NY	945	3	Carter: Putr.	C & D	C&D
TIA OF NEW YORK	SUFFOLK	NY	200	1	Carter: Putr.	Concrete	C&D
A & D CARTING CORP.	WESTCHESTER	NY	480	2	Carter: Putr.	C & D	C&D
J RUTICLIANO WASTE REMOVAL	NASSAU	NY	625	2	Carter: Putr.	Mixed Paper	recyclable
UNITED SANITATION INC	QUEENS	NY	246	1	Carter: Putr.	Corrugated Cardboard	recyclable
DYNAMIC RUBBISH REMOVAL	SUFFOLK	NY	58	0	Carter: Putr.	Mixed Recyclables	recyclable
DYNAMIC RUBBISH REMOVAL	SUFFOLK	NY	523	2	Carter: Putr.	Mixed Recyclables	recyclable
TIA OF NEW YORK	SUFFOLK	NY	1,012	3	Carter: Putr.	Corrugated Cardboard	recyclable
Non-Putrescible Omitted:			95,405	306			
Putrescible Omitted							
GREGOR CARTING CORP	NASSAU	NY	3,479	11	Carter: Putr.	Putrescible MSW	C&D
CHELSEA GARDEN CENTER, INC.	NEW YORK	NY	30	0	Self Haulers: Putr.	Grass, Landscape Material	Greenwaste
FILCO CARTING CORP.(ALSO CF WASTE PAPER CO.)	BROOKLYN	NY	37,211	119	Carter: Putr.	Putrescible MSW	misclassified
NECESSARY OBJECTS LTD	NEW YORK	NY	130	0	Self Haulers: Putr.	Putrescible MSW	self haul
TRUSTEES OF ST. PATRICK'S CATHEDRAL	NEW YORK	NY	20	0	Self Haulers: Putr.	Putrescible MSW	self haul
Putrescible Omitted			40,869	131			
Putresible Retained							
HERITAGE CARTING CORP	BRONX	NY	259	1	Carter: Putr.	Putrescible MSW	
BAVARO CARTING CORP	BROOKLYN	NY	198	1	Carter: Putr.	Putrescible MSW	
CONSUMERS RUBBISH REMOVAL INC.	BROOKLYN	NY	564	2	Carter: Putr.	Putrescible MSW	
CONSUMERS RUBBISH REMOVAL INC.	BROOKLYN	NY	124	0	Carter: Putr.	Putrescible MSW	
AJI INDUSTRIES	NASSAU	NY	7,728	25	Carter: Putr.	Putrescible MSW	
CROWN WASTE CORP.	NASSAU	NY	1,370	4	Carter: Putr.	Putrescible MSW	
FRANK LOMANGINO & SONS	NASSAU	NY	4,745	15	Carter: Putr.	Putrescible MSW	
JOE MOREA & SONS PRIVATE SANITATION	NASSAU	NY	5,400	17	Carter: Putr.	Putrescible MSW	
JOE MOREA & SONS PRIVATE SANITATION	NASSAU	NY	600	2	Carter: Putr.	Putrescible MSW	
CINELLI CARTING	QUEENS	NY	3,933	13	Carter: Putr.	Putrescible MSW	
HILLSIDE CARTING CO INC	QUEENS	NY	1,277	4	Carter: Putr.	Putrescible MSW	
UNITED SANITATION INC	QUEENS	NY	3,996	13	Carter: Putr.	Putrescible MSW	
UNITED SANITATION INC	QUEENS	NY	291	1	Carter: Putr.	Putrescible MSW	
STAR RUBBISH REMOVAL	STATEN ISLAND	NY	5,200	17	Carter: Putr.	Putrescible MSW	
DYNAMIC RUBBISH REMOVAL	SUFFOLK	NY	568	2	Carter: Putr.	Putrescible MSW	
DYNAMIC RUBBISH REMOVAL	SUFFOLK	NY	1,878	6	Carter: Putr.	Putrescible MSW	
DYNAMIC RUBBISH REMOVAL	SUFFOLK	NY	99	0	Carter: Putr.	Putrescible MSW	
PARK RUBBISH REMOVAL	SUFFOLK	NY	1,265	4	Carter: Putr.	Putrescible MSW	
PARK RUBBISH REMOVAL	SUFFOLK	NY	2,162	7	Carter: Putr.	Putrescible MSW	
TIA OF NEW YORK	SUFFOLK	NY	1,800	6	Carter: Putr.	Putrescible MSW	
Putresible Retained			43,457	139			
TOTAL EXCESS			179,732	576			

(1) Data extracted from 2000 Survey Forms

APPENDIX A

FACILITIES ESTIMATE OF PUTRESCIBLE WASTE GENERATION YEAR 2002

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1.0 INTRODUCTION

Three different methodologies were used to quantify the putrescible[1] portion of commercial waste generated in New York City (City), inclusive of the total amounts disposed and recycled. One method, reported here and called the **Facilities Estimate,** determined the number of tons processed or received for disposal at Transfer Stations located within the City or directly hauled in collection vehicles to transfer stations, landfills, waste-to-energy (WTE) facilities or materials recycling facilities (MRFs) outside the City.

This estimate will be compared to the other methodologies: (1) the **Employment Estimate**, obtained by multiplying employee waste generation rates by the number of individuals employed within the City; and (2) the Business Integrity Commission-City Department of Sanitation (**BIC-DSNY) Estimate**, which surveyed City private carters in order to estimate the quantities of putrescible waste and recyclables collected from commercial establishments in the City. The data reported in the Facilities Estimate is for calendar year 2002.

These efforts build upon and refine the Comprehensive Commercial Waste Management Study, Preliminary Report (Preliminary Report). The Preliminary Report, released by the City Department of Sanitation (DSNY) in 2002, provides data on commercial waste generated by businesses in the City in 2000. It relied on DSNY's Quarterly Transfer Station Report system (Quarterly Reports) and interviews with carters operating in the City as primary data sources. It did not attempt to determine the total quantity of recyclables generated by City business establishments, nor did it obtain extensive information about disposal of wastes via direct haul in collection vehicles to out-of-City disposal facilities.

[1] The term "putrescible solid waste" shall mean solid waste containing organic matter having the tendency to decompose with the formation of malodorous by-products. (Administrative Code of New York City, Title 16, Chapter 1, Section 130).

The Facilities Estimate also relies upon DSNY's Quarterly Reports for data on waste tipped at in-City Transfer Stations in 2002. The Quarterly Reports are complemented with additional data on direct out-of-City disposal of the City's commercial waste and recyclables and on recyclable processing within City boundaries. The Facilities Estimate was developed by contacting major in-City recycling facilities and waste transfer, disposal and processing facilities located outside of the City to determine if they were receiving commercial waste from the City.

2.0 METHODOLOGY

2.1 Travel Times to Out-of-City Facilities

The initial step in developing the Facilities Estimate was to identify a list of potential out-of-City sites that may be handling or processing commercial waste that is hauled directly from the City. Similarly, a list of facilities handling recyclables both within and outside the City had to be created.

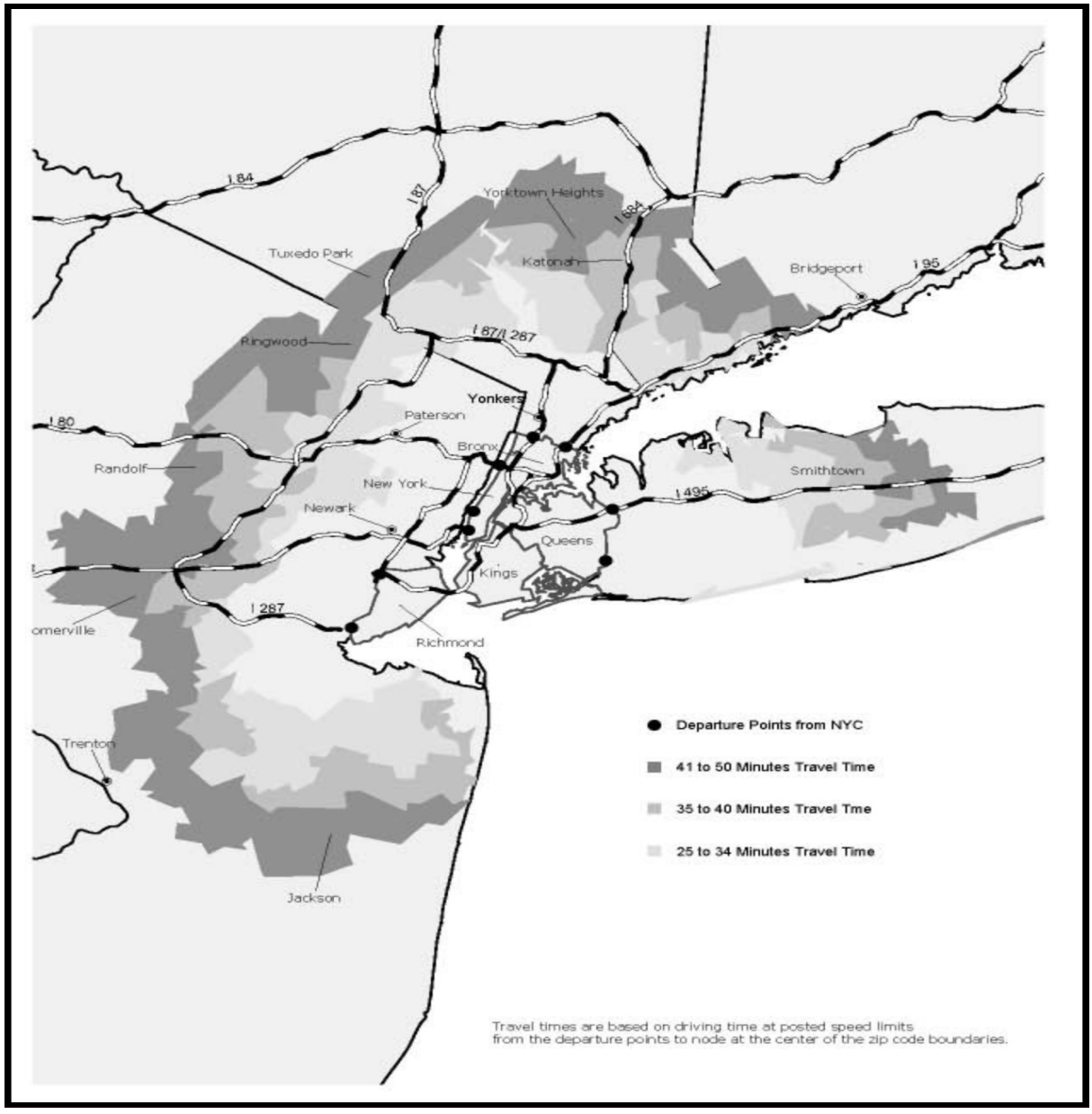
The economics of carting waste and recyclables picked up by collection vehicles directly to out-of-City facilities limits deliveries to facilities located nearby, in surrounding counties and states. Thus, the first step was to create a map with vehicle travel times and mileages radiating out from the City. Localities within a 50-minute travel time were included and those facilities located within this travel time boundary were contacted. In addition, if state documents or interviews with haulers indicated that City commercial waste was hauled directly beyond the 50-minute travel threshold, those destinations were contacted.

Figure 2.1-1 is a map depicting communities that are within several travel-time isopleths out to the 50-minute travel time limit. In New York State, facilities in Nassau, Suffolk and Westchester Counties are within this limit and were contacted. In New Jersey, sites in Bergen, Essex, Hudson, Middlesex, Passaic and Union Counties were queried, and in Connecticut, those in Fairfield County were contacted.

2.2 New York State Solid Waste and Recycling Facilities –Outside New York City

Lists of licensed transfer stations and WTE facilities outside the City were obtained from state agencies, including the New York State Legislative Commission on Solid Waste Management and the New York State Department of Environmental Conservation (NYSDEC). In addition, a partial list of construction and demolition (C&D) recyclers and recycling facilities was developed for NYSDEC Regions 1 and 3 from the same data source.

Figure 2.1-1
Travel Times from New York City Borders Map



Attempts were made to obtain information from state permitting agencies about the origins of waste coming into various facilities. However, these were unsuccessful because the state of New York was unwilling to release this information by facility, and an attempt to obtain the data by filing a Freedom of Information Act request failed. The state declared that it was unable to produce a report with the requested specificity.

2.3 New York City Recycling Processing Facilities

Several data sources were used to develop a list of facilities located within the City. The surveys collected for the Preliminary Report were reviewed to obtain data on which carters had indicated they collected recyclables.

The Preliminary Report also included some data on recovery of recyclables at Transfer Stations regulated by DSNY. Major commercial waste haulers, such as Waste Management, Sprint Recycling, and Action Carting were contacted to determine where they took the recyclables that they collected. And, the Yellow Pages listings for each borough were searched under the category of "Recycling Centers" to identify a list of facilities that were processing commercial recyclables in 2002.

2.4 Connecticut Solid Waste and Recycling Facilities

The Connecticut Department of Environmental Protection (CDEP) provided a list of Connecticut facilities that might be receiving waste directly hauled from the City. Follow-up discussions with the CDEP and with private haulers handling the City's commercial waste determined that it was highly unlikely that in 2002 carters were hauling waste directly to most Connecticut facilities, due to the travel time involved. Thus, only the Connecticut facilities in Fairfield County were contacted.

2.5 New Jersey Solid Waste and Recycling Facilities

The New Jersey Department of Environmental Protection (NJDEP) compiles a list of solid waste facilities by type of waste received and city and county location, and also tracks the origin of incoming waste. The annual reports submitted to the NJDEP by licensed waste processing facilities were reviewed to identify facilities that received waste from New York State in 2002, and each of these facilities was called to determine if the City was the source of this waste.

In addition, data on the amount of DSNY-managed Waste sent to New Jersey facilities was obtained from DSNY and cross-checked against the NJDEP data. Total waste received from the City minus the DSNY-managed residential waste was computed as the quantity of commercial waste originating in the City.

The State of New Jersey also compiles lists of MRFs, by county. However, these facilities are not required to record the state of origin of materials received. Thus, data on recycling facilities were obtained through telephone interviews.

In addition, the Yellow Pages of selected cities, including Jersey City, Newark, Clifton and Paterson were searched for recycling facilities; potential sites were added to the list. The carter data collected as part of the Preliminary Report were also reviewed to obtain the names of possible out-of-City facilities that received commercial recyclables for processing.

2.6 Survey Administration

The first step in administering the survey was to define the list of facilities to be contacted. The list included all the facilities receiving putrescible wastes in New Jersey, New York State, and Fairfield County, Connecticut.

In addition, all recycling facilities likely to be utilized by companies collecting recyclables in the City were compiled into the recycling list. These facilities were classified into categories of processors or end users. As paper in particular is often transported long distances for sale and processing, one member of the DSNY Consultant team surveyed the fiber mills in the region.

After identification and categorization, each facility was surveyed by telephone. The facilities were assured that the data would be reported only in the aggregate, and that the levels of activity of individual facilities would not be revealed. The survey instrument is Attachment 1 to this Appendix, and the list of facilities that were contacted is included in Attachment 2.

The total number of solid waste facilities by state, county and type that were contacted is shown in Table 2.6-1. A similar distribution for recycling facilities is shown in Table 2.6-2. Thirty-one (31) facilities handling municipal solid waste (MSW) were contacted, of which 24 are located in New Jersey, two are located in New York State outside of the City, and five are in Pennsylvania. One-hundred-and-twenty (120) recycling facilities were contacted, of which 54 are located in New Jersey, 10 are located in New York State outside of the City, 45 are located within the City, and 11 are located in other states.

The focus of the survey was to determine the tonnage of putrescible waste originating in the City for each facility. Recyclables are categorized into fiber (including old corrugated cardboard [OCC], old newsprint [ONP], mixed office paper [MOP], and other paper); plastics; metal; wood; glass and other. All data were converted into annual tons.

Table 2.6-1
Solid Waste Facilities Contacted by County and Type

State	County	Number	Type of Facility		
			Transfer Stations	WTE Facilities	Landfill
New Jersey	Bergen	7	7	0	0
	Camden	1	0	1	0
	Essex	4	3	1	0
	Hudson	1	1	0	0
	Passaic	4	4	0	0
	Somerset	1	1	0	0
	Union	5	4	1	0
	Warren	1	0	1	0
	Subtotal	**24**	**20**	**4**	**0**
New York	Nassau	1	0	1	0
	Suffolk	1	0	1	0
	Subtotal	**2**	**0**	**2**	**0**
Pennsylvania	Bucks	2	0	0	2
	Delaware	1	0	1	0
	Montgomery	1	0	0	1
	York	1	0	0	1
	Subtotal	**5**	**0**	**1**	**4**
Grand Total		**31**	**20**	**7**	**4**

Table 2.6-2
Recycling Facilities Contacted by County and Type

State	County	Number
New Jersey	Atlantic	1
	Bergen	12
	Essex	18
	Hudson	15
	Middlesex	1
	Monmouth	1
	Passaic	5
	Union	1
	Subtotal	**54**
New York (out-of-City)	Albany	3
	Nassau	1
	Oswego	1
	Saratoga	1
	Schenectady	1
	Suffolk	1
	Washington	1
	Westchester	1
	Subtotal	**10**
New York City	Bronx	8
	Brooklyn (Kings)	19
	Manhattan (New York)	7
	Queens	10
	Staten Island (Richmond)	1
	Subtotal	**45**
Other States	Massachusetts	4
	Missouri	1
	Pennsylvania	5
	South Carolina	1
	Subtotal	**11**
Grand Total		**120**

3.0 ANALYSIS

3.1 Commercial Solid Waste Hauled to Facilities Outside New York City

In 2002, a total of 266,642 tons of the commercial waste generated in the City were hauled directly out of the City for disposal. Table 3.1-1 shows the destinations of commercial waste carted from the City in waste collection vehicles by tons, and, where known, borough of origin.

Table 3.1-1
Commercial Waste Carted Directly Out of City

State	Total Facilities Contacted	Number of Facilities Taking New York City Commercial Waste	Tons of Commercial Waste	Borough of Origin
New Jersey	24	10	264,242	Manhattan/Staten Island
New York (non-City)	2	1	1,200	Brooklyn/Queens
Pennsylvania	5	1	1,200	NA
Total	**31**	**12**	**266,642**	

Notes:
NA = Not Available

3.2 Commercial Solid Waste Tipped at Facilities within the City and Carted to Out-of-City Facilities

The major portion of commercial putrescible waste generated within the City is tipped at in-City Transfer Stations and then transferred by truck or rail to disposal facilities throughout the region. DSNY receives Quarterly Reports from operators of in-City Transfer Stations of the waste processed at these facilities. Table 3.2-1 shows the amount of commercial putrescible waste handled by these Transfer Stations in 2000, 2001 and 2002.

Table 3.2-1
Commercial Putrescible Waste Disposed
(tons)

Time Period	2000	2001	2002
First Quarter[1]	570,102	564,876	493,818
Second Quarter[1]	678,366	558,402	528,762
Third Quarter[1]	701,610	573,690	492,570
Fourth Quarter[1]	600,522	553,800	491,166
Out-of-City Facilities[2]	205,296	235,969	266,642
Annual Totals	**2,755,896**	**2,486,737**	**2,272,958**

Notes:
[1] Quarterly data are from the DSNY Bureau of Planning & Budget Quarterly Recap column entitled "Total NYC Commercial Waste Stream" for Putrescible Transfer Stations.
[2] Out-of-City facilities data for 2000 is from the Preliminary Report, Table 2. For 2002, it is from the Facilities Estimate described herein (see Table 3.3.4-1). The out-of-City data for 2001 is estimated as the average of the 2000 and 2002 figures.

The data in Table 3.2-1 show annual tons delivered to Transfer Stations within the City plus estimated waste carted in collection vehicles directly to out-of-City disposal facilities. No recyclables are included in these totals.

The source for the in-City tons transferred is DSNY's Quarterly Reporting system, which reports data in tons per day (tpd). The tpd data have been converted to annual tons by assuming that Transfer Stations operate 6 days per week, 52 weeks per year, or 78 days per quarter.

The year 2000 estimate of annual tons carted to out-of-City facilities is taken from the Preliminary Report. Year 2002 is the Facilities Estimate in which 31 out-of-City facilities were surveyed, as discussed above. The 2001 quantity is estimated as the average of the quantities for 2000 and 2002.

Table 3.2-1 shows that the disposed commercial putrescible waste has decreased by over 480,000 tons between 2000 and 2002. The magnitude of the decrease in the commercial waste stream – a 17.5% drop – is not fully explainable. Between 2000 and 2002, there undoubtedly has

been some reduction in commercial waste generation, attributable to the loss of jobs in that interval -- in part as a result of 9/11 and in part from the ongoing recession. Nevertheless, as there is not complete data on commercial recycling for either the year 2000 or the year 2001, it is impossible to reject the possibility that some of the decrease in commercial waste is attributable to an increase in recycling. What is certain is that the commercial waste disposed tonnage has decreased dramatically in this three-year period.

3.3 Commercial Recyclable Processing

3.3.1 Structure of Paper Recycling Industry

Because of the size of office sector employment in the City, paper comprises the major commodity recycled by commercial establishments in the City. In addition, most of the paper that is recovered is obtained from commercial sources. The principal grades are OCC and MOP, with some industrial scrap from printers and other businesses that convert paper into products.

The flow of paper takes one of two paths. One path involves private carters picking up paper at office buildings or other generators, then delivering these recyclables to a processing center or a recycling center where the material is sorted and baled. A second path involves paper dealers who have customers (generators) that contract separately for this service. The paper dealers' trucks (owned or hired) deliver the material to a packing plant where the paper is processed and baled. OCC is a predominant part of the business. Both the City and north New Jersey dealers receive paper in this way. In a survey of Manhattan and Brooklyn property managers, most large buildings were found to contract with the same firm for garbage collection and collection of recyclables; they typically receive a single monthly bill for both services.

There are independent brokers and dealer/brokers that buy paper for shipment to paper mills and/or exporters. There are also relationships between carters and dealers, dealers and paper mills, and independent dealers and recycling centers.

3.3.2 Commercial Recycling in the City

City regulations[2] require commercial establishments to recycle. Office buildings and institutions often separate fiber from their wet waste. Usually, a single hauler picks up both waste streams. In some cases additional materials, such as metals and containers, are separated by the hauler. In order to determine both the amount and location of commercial recyclable processing, facilities were contacted in the City, New York State, New Jersey and several other states. Table 3.3.2-1 provides estimates of the tonnages of commercial recyclables processed by the various facilities, broken down by type of material.

Table 3.3.2-1
Estimates of Commercial Recyclables

State	Number of Facilities		Tonnages Processed 2002 Annual Numbers						
	Called	Accepts Recyclables	OCC	MOP	ONP	Other Paper	Total Paper	Other(1)	Total
New Jersey	54	8	21,975	67,990	0	26,736	116,700	15,453	132,154
New York City	45	18	393,838	347,178	25,509	108,080	874,605	15,960	890,565
New York State	10	0	0	0	0	0	0	0	0
Other States	11	0	0	0	0	0	0	0	0
Total	**120**	**26**	**415,813**	**415,168**	**25,509**	**134,816**	**991,306**	**31,413**	**1,022,719**

Note:
(1) Other = 28,000 tons of glass deposit containers, 2,453 tons of mixed containers, and 960 tons of shrink-wrap.

Table 3.3.2-1 shows that most recycling by commercial establishments in the City is paper. This is expected, as large office buildings may recycle 70% of their waste stream. Typically, the papers are mixed, with only putrescible disposed separately. The mixed papers are collected at

[2] Local Law 87, 1992; Administrative Code Title 16, 16-306(a),(b).

night and taken to Transfer Stations or MRFs in the metropolitan area. Of the 26 facilities contacted who process recyclables from the City, about half indicated that they shipped the paper abroad, usually to Asia, for sorting into as many as 18 grades of paper.

3.3.3 Trends in Commercial Recycling

Because of the lack of complete commercial recycling data for the year 2000, it is not possible to determine definitively whether recycling has increased from 2000 to 2002 as disposed commercial waste has declined, or whether the opposite has occurred. However, it is possible, based on some strong anecdotal and statistical evidence (see Table 3.3.3-1), to argue that recovery of paper from the City and aggregate commercial recycling declined significantly in 2002 from 2000.

The survey of paper dealers and brokers revealed a consistent theme – that after 9/11, recovery of paper for recycling dropped dramatically. This decline continued into 2002. Table 3.3.3-1 is a summary of exports by major paper grade category for the years 1997 through 2002. Exports of recovered paper and paperboard (cardboard, not corrugated – like cereal boxes) from the Port of New York and New Jersey, a major export port, are one of the key indicators of paper recovered through recycling in the City. An analysis, included in Table 3.3.3-1, was made of these exports of paper and paperboard.

The data in Table 3.3.3-1 indicate the following:

1. Exports of paper from the Port of New York and New Jersey declined from a peak of 3 million tons in 2000 to about 2 million tons in 2001 and 2002. This decline strongly suggests (but does not prove) that there was a large decline in recyclables recovery in the City, especially Manhattan.
2. Total paper exports from the United States were comparable in 2001 to the increased tonnages reported in 2000; in 2002 they reported a considerable gain over 2001. This occurred while exports from New York/New Jersey dropped. The New York/New Jersey exports dropped from 28.9% of total exports in 2000 to 17.6% of total exports in 2002.

Table 3.3.3-1
Exports[1] of Recovered Paper Stock, 1997 through 2002

Year	OCC	Mixed[3]	News, Other Groundwood	High-Grade De-inking	Pulp Substitutes	Total[2] Port of New York	Total USA	New York % of Total
1997	770	455	735	100	138	2,198	7,505	29.3
1998	812	637	1,051	113	142	2,756	8,100	34.0
1999	757	697	1,019	172	51	2,696	8,286	32.5
2000	893	761	1,032	313	57	3,055	10,560	28.9
2001	811	525	335	262	31	1,964	10,533	18.6
2002	909	627	332	90	47	2,004	11,404	17.6

Notes:
(1) In thousands of tons.
(2) From the Port of New York and New Jersey.
(3) Includes mail.
Subtotals may not add to total due to rounding.
Source: American Forest & Paper Association, based on Export Statistics of the U.S. Department of Commerce.

3. The recyclables showing the greatest decline were newspapers and other groundwood papers, and de-inking grades. At the same time, the quantities of OCC remained steady, while mixed paper declined by about 230,000 tons in 2001 and 135,000 tons in 2002 compared to 2000.
4. The overall conclusion is that a high percentage of the decline in recovered paper exports is related to the decline in recycling City commercial waste.

3.3.4 Commercial Recycling Rates in New York City

The information on recycling and waste disposed provides a basis for computing the commercial sector recycling rate – from materials generated and normally included in the definition of MSW.

In 2002, facilities other than DSNY-licensed Transfer Stations processed 1,022,719 tons of recyclables. In 2002 the total waste disposed was 2,272,958 tons. Thus, the commercial sector generated 3,295,677 tons of waste disposed and recycled; the recycling rate was 31%. Table 3.3.4-1 displays these summary statistics.

Table 3.3.4-1
Summary of New York City Commercial Putrescible Waste
Disposed and Recycled, 2000-2002

Item	2000	2001	2002
Waste Disposed (tons)			
First Tipped in City	2,550,600	2,250,768	2,006,316
Direct Hauled out of City	205,296	235,969	266,642
Total	2,755,896	2,486,737	2,272,958
Waste Recycled (tons)			
First Tipped in City	NA	NA	890,565
Direct Hauled out of City	NA	NA	132,154
Total	NA	NA	1,022,719
Grand Total (tons)	NA	NA	**3,295,677**
Recycling Rate	**NA**	**NA**	**31%**

ATTACHMENT 1

FACILITIES SURVEY

FACILITY QUESTIONAIRE FOR FACILITIES RECEIVING NYC COMMERCIAL/C&D WASTE

New York City Department of Sanitation Commercial Waste Study

Interviewer _____

1. Name of Facility: _____

Date of Interview _____

2. Type of Facility _____

1=Transfer Station
2=Materials Recovery Facility
3=Landfill
4=C&D Disposal Facility
5=Materials Broker
6=Material End User
7=Other, Please explain _____

3. Facility Address: Street _____

City, State, Zip _____

4. Contact Person

Name _____ Owner _____
Title _____
Phone _____
Fax _____
Email _____

5. Total Tonnage Throughput: -- direct hauled from New York City. Not including material from DOS. (in 2002)

TYPE OF MATERIAL	Tons			Weighed 1=yes 2=no	If weighed, what is the density factor Lbs/cubic yd.
	Total in 2002	From NYC	Borough of NYC		
Putrescible MSW					
Yard Debris					
Recyclables(Total, if not broken down)					
Metal					
Tin Cans					
Other Ferrous Metal Scrap					
Aluminum Cans					
Aluminum Foil					
Other Non-Ferrous Scrap					
Other Metals					
Plastic					
Glass					
Fiber					
ONP					
OCC					
OMG					
Mixed Office Paper					
Mixed Paper					
Other					
C&D					
Wood					
Fill					
Bricks/Concrete					
% Residential Construction					
% Commercial Construction					
% Residential Demolition					
% Commercial Demolition					
% Residential Renovation					
% Commercial Renovation					
Other Material (Specify)					
TOTAL TONS					

ATTACHMENT 2

LIST OF FACILITIES SURVEYED

List of Facilities Surveyed

Name	Address	City	State	Zip
American Tissue Mills of Massachusetts, Inc.		Baldwinville	MA	
FiberMark, Inc.		Fitchburg	MA	
Newark Atlantic Paperboard Corp.			MA	
Perkit Folding Box Corp.			MA	
Smurfit Stone Recycling Co.		St. Louis	MO	
Marcal Paper Mills			NJ	
Atlantic Coast Paper Company (7)		Clifton	NJ	
County Wide Recycling		Hillsdale	NJ	
G&T Trading International Corp.		Clifton	NJ	
Global Fibres Inc.		Fort Lee	NJ	
Lobosco Recycling		Clifton	NJ	
M. Politinsky & Sons Inc.		Clifton	NJ	
Recycled Paperboard of Clifton		Clifton	NJ	
S Morena & Sons Inc.		Lodi	NJ	
Zozzaro Brothers	175 Circle Avenue	Clifton	NJ	07011
Garafolo Recycling and Transfer	19-33 Atlantic Street	Garfield	NJ	07026
All American			NJ	
Jem Sanitation	P.O. Box 708	Lyndhurst	NJ	07071
Advanced Enterprises Recycling	540 Doremus Street	Newark	NJ	07105
Allied Paper		Newark	NJ	
Garden State Paper Co., Inc.			NJ	
Giordano Paper Recycling	145 Manchester Place	Newark	NJ	07104
J Lobosco & Sons	964 McBride Avenue	Little Falls	NJ	
James DeMarco & Sons Inc		Newark	NJ	
KTI Recycling/Recycle America	150 Charles Street	Newark	NJ	07105
Newark Boxboard			NJ	
Patsy Ragonese & Sons Inc.		Newark	NJ	
Prins Recycling Corp.		Newark	NJ	
Recycled Fibers (Newark Group Inc)		Newark	NJ	
Recycled Fibers-- Eastern Region	60 Lockwood Street	Newark	NJ	07105

Name	Address	City	State	Zip
Recycling & Salvage Co.	170 Frelinghuysen Avenue	Newark	NJ	07114
Recycling Systems, Inc.		Newark	NJ	
Shamrock Fibres, Inc.		Upper Montclair	NJ	
T. Fiore Recycling Co.	411 Wilson Avenue	Newark	NJ	07105
Tristate Recycling Center, Inc.		Fairfield	NJ	
CRG Recycle America	104 East Peddie Street	Newark	NJ	07114
Arrow Recycling		Jersey City	NJ	07302
Atlas Paper Stock Co.		Jersey City	NJ	
Falesto Bros.		Jersey City	NJ	
Galaxy Recycling	326 New York Avenue	Jersey City	NJ	07307-1402
Interboro Disposal & Recycling		Hoboken	NJ	
Recycling Specialists, Inc (5)	375 Rte 1&99	Jersey City	NJ	07302
Recycling Ventures, Inc.	35 US Highway #1	Jersey City	NJ	07302
Reliable Paper Recycling	200 Pacific Avenue	Jersey City	NJ	07304
Rock-Tenn Co.			NJ	
Tri-State Recycling Services	111 Woodward Street	Jersey City	NJ	07304
United Recycling	55 16th Street	Hoboken	NJ	07030
Krueger Recycling			NJ	
Galaxy Recycling	325 New York Avenue	Jersey City	NJ	07307-1401
Cardella Trucking		N. Bergen Tshp	NJ	
M&M (2)	2 Fish House	Hudson	NJ	
Recycling Industries, Inc.		South Plainfield	NJ	
KC International Ltd.		Lakewood	NJ	08701-5600
Annex Paper Stock Inc. (Damato)		Paterson	NJ	
John Rocco Scrap Material Inc.		Elizabeth	NJ	
Paper Board Specialties Inc.		Paterson	NJ	
United Scrap Iron & Metal	157 East 7th Street	Paterson	NJ	07524
Zager Brothers	69 Getty Avenue	Paterson	NJ	07503
A.J. Recycling		Linden	NJ	
American Tissue Mills of Greenwich, Inc.			NY	
Fort Orange Paper Co.			NY	
American Tissue Mills of New York, Inc.			NY	

Name	Address	City	State	Zip
Hunts Point Recycling Co.	315 Casanova Street	Bronx	NY	10474 6707
Kids Waterfront Corp.	1264 Viele Avenue	Bronx	NY	
Louis Monteleone Fibres, Inc.		Bronx	NY	
Paper Services, Inc. (Benedetto)		Bronx	NY	
Pascap Co., Inc.		Bronx	NY	10475
Paper Fibers Corp.	960 Bronx River Avenue	Bronx	NY	
Triboro Fibers	770 Barry Street	Bronx	NY	10474
IESI	246-266 Canal Place	Bronx	NY	Jersey City NJ
Advance Paper Recycling	139 Plymouth Street	Brooklyn	NY	11201-8335
Alpine Paper Recycling	2 N. 5th Street	Brooklyn	NY	
American Recycle	236 12th Street	Brooklyn	NY	
Filberto Recycling, Inc.		Brooklyn	NY	
Joe's Waste Paper Corp.		Brooklyn	NY	
Point Recycling	120 Hausman Street	Brooklyn	NY	11222
Smith Recycling		Brooklyn	NY	
Tocci Bros., Inc.	P.O. Box 20500	Brooklyn	NY	11202-0500
Trans-American Paper Fibers Corp.		Brooklyn	NY	
Ursula Products, Inc.		Brooklyn	NY	11203
Waste Management		Brooklyn	NY	
Williamsburg Paper Stock Co.		Brooklyn	NY	
Parkside Recycle	236 N. 12th Street	Brooklyn	NY	11211-1101
Hi Tech Resource Recovery	130 Varick Street	Brooklyn	NY	
Rapid Recycling Paper Co	860 Humbolt Avenue	Brooklyn	NY	
A&R Lobosco		Brooklyn	NY	
Chambers Paper	139 Plymouth Street	Brooklyn	NY	11201
Metropolitan Paper	Spring Creek Shepherd Avenue	Brooklyn	NY	
Recycle America (3)	2 N Fiske Street	Brooklyn	NY	
Omni Recycling Westbury	7 Portland Avenue	Westbury	NY	11590
Durango-Georgia Paper Co.		New York	NY	
Equipment & Parts Export Inc.	745 5th Avenue, Ste. 1114	New York	NY	10151
Korexpo Corporation		New York	NY	10279
M.G. Chemical Co., Inc.		New York	NY	10274

Name	Address	City	State	Zip
Robbins Fleisig FWDG., Inc.		New York	NY	10007
Veterans Paper Stock & Mill Supply Co. Inc.		New York	NY	
Sprint Recycling	605 W. 48th Street	New York	NY	
Internation Paper Co.		Oswego	NY	
Apple Fibers	18056 Liberty Avenue	Jamaica	NY	11433-1435
Asia Business Recycling	13511 Roosevelt Avenue	Flushing	NY	11354-5305
Cross County Recycling Corporation	122-52 Montauk Street	St. Albans	NY	11413
R. Palmiere Co.		South Ozone Park	NY	
Boro Wide Recycling	3 Railroad Place	Maspeth	NY	11378
Giove	108-20 180th Street	Jamaica	NY	
EWG Glass Recycling	145-11 Liberty Avenue	Jamaica	NY	11435
Babylon Paper	South Road	Jamaica	NY	
Royal Recycling (4)			NY	
A&R Lobosco	3133 Farrington Street	Flushing	NY	11354
Visy Paper		Staten Island	NY	
International Paper Co.		Corinth	NY	
Sonoco Products Co.		Amsterdam	NY	
Omni Recycling of Babylon	114 Alder Street	West Babylon	NY	11704
Irving Tissue, Inc.		Fort Edward	NY	
Karta Container		Peekskill	NY	
Interstate Intercorr		Reading	PA	
Rock-Tenn Co.		Downingtown	PA	
Smurfit-Stone Container Corp.		York	PA	
Tarkett Inc.			PA	
Woodstream Corp.			PA	
Harmon Associates/Georgia Pacific			SC	

APPENDIX B

EMPLOYMENT-BASED ESTIMATE OF PUTRESCIBLE WASTE GENERATION YEAR 2002

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1.0 EMPLOYMENT-BASED MODEL

1.1 Introduction

There are a number of different means of estimating solid waste quantities within the commercial sector, depending on the specific reference utilized. Some studies reviewed for this analysis estimated annual waste generation based upon pounds per dollar sales or production, pounds per square feet of facility space, or pounds per employee. While the utilization of each method has its own advantages and disadvantages, in this Commercial Waste Management Study (Study), due to the existence of complete and readily available data sets from government sources, employment was used to determine waste generation and to project future quantities. Additionally, employment projections were available allowing for forecasting waste generation over a 20-year planning period.

The methodology used to estimate putrescible waste generation by New York City's (City) commercial sector based on employment is straightforward. Factors were developed for the generation of commercial wastes in tons per employee per year, by federal Standard Industrial Classification (SIC) and by material type (for example, old corrugated cardboard [OCC]). These factors were multiplied by the number of employees in the City within any given sector (e.g., food service, finance, health care) to obtain generation of commercial waste. A number of separate calculations and data sources were required to complete the model, as described below.

1.2 Development of Waste Generation Factors

A survey of literature on the subject identified a wide variety of data and reports related to urban commercial waste generation factors, usually in pounds per employee per day or tons per employee per year. Sources included the City Department of Sanitation (DSNY) Consultant's in-house documents (e.g., sampling studies), magazine articles and on-line data such as that on the California Integrated Waste Management Board web site. Sources of relevant sampling studies were contacted by phone to obtain copies of the study reports. The most desirable sources had both the results of sampling studies in tons correlated with data on employment in

the sampled business or industry. In some instances it was possible to obtain employment data from a source, e.g., the federal document *County Business Patterns* (available on-line from the U.S. Census Bureau), to match published sampling data on commercial generators.

The data obtained were entered into a spreadsheet by business category, e.g., "Hotels." Sources and units (e.g., pounds or tons per employee per year) were entered into the spreadsheets. If the data source identified the relevant SIC, that was also entered.

The next step was to create a matrix spreadsheet that listed sampling data by business type vertically and material types horizontally. Data for each type of business, e.g., "Offices," were grouped together. Since the sampling studies varied in the amount of detail for different types of materials, materials were also grouped as appropriate. For example, a variety of papers were grouped together into an "Office Papers" category.

Some sampling studies reported results by materials disposed, not generated, i.e., recycled materials were not accounted for. These disposal data, by material, were converted to generation-factor data by DSNY's Consultant, using a previous report on recycling of paper in commercial sites. A Franklin Associates report characterizing national municipal solid waste generation and recycling for the United States Environmental Protection Agency (USEPA) was also used to derive reasonable recycling rates.

Disposal data were added to recycling data to obtain generation data. Construction and demolition (C&D) debris generation data were removed from the database because the City's C&D debris generation is estimated using a different methodology that is reported separately.

Because waste generated by commercial landscaping is substantially lower in the City compared to data collected on other cities, this factor was adjusted in the database by assuming that the City's commercial landscape waste represents a minimal 1% of waste composition. This was added to each employment category. The final data for generation per employee were then created by averaging commercial generation, by material, for each category, such as "Offices" and "Retail."

1.3 Development of Employment Data

Employment data were developed using data from New York Metropolitan Transportation Council (NYMTC). The data were compiled by borough and by community district (CD).

NYMTC prepared employment for the City through the year 2025 early in 2001, basing their projections on the most current employment data available at that time. These projections were revised by NYMTC over the course of 2002 and 2003 to account for the effects of the September 11, 2001 disaster. An interim update of the projections was published by NYMTC in a supplement to "Demographic and Socioeconomic Forecasting Post September 11 Impacts, Technical Memoranda 3.1 and 3.2," which reported the direct effects of September 11 -- both direct job loss in the City and geographic redistribution of employment within the City. These interim projections have been utilized as the fundamental employment projection data on which the DSNY waste estimation model relies.

Additional modifications to the interim projections, however, have been undertaken to reflect current (2002) conditions at the CD level. First, the projections, which were available at the census tract level, have been translated into CDs according to City Department of City Planning (NYCDCP) guidance. Second, the job loss resulting from the effects of economic recession in the City, which was not reflected in the NYMTC interim projections, has also been incorporated into the projections on which DSNY efforts rely. City employment statistics, at the borough level, for 2002 are shown in Table 1.3-1. Attachment 1 to this Appendix provides a detailed discussion of the derivation of the employment estimates used in this report.

1.4 Development of Final Model and Results

The generation per employee data were combined into categories to match the City's labor categories. City commercial waste generation by material categories was estimated by multiplying generation factors by employment. The "Education" and "Local Government" categories of employment were excluded because this waste is primarily collected by DSNY.

Table 1.3-1
Annual Employment in New York City by Borough and by Employment Category, 2002
(Number of Employees)

Employment Category	Bronx	Brooklyn	Manhattan	Queens	Staten Island	Total Employees
Construction	10,508	23,043	32,976	44,442	7,021	117,990
Finance & Insurance	3,291	15,014	302,617	13,459	2,536	336,917
Real Estate Rental & Leasing	10,838	14,444	75,962	15,573	1,573	118,390
Manufacturing	9,948	36,267	53,423	41,115	1,357	142,110
Wholesale Trade	10,313	22,774	87,617	24,882	1,463	147,049
Retail Trade	24,643	57,234	136,564	53,016	15,974	287,431
Transportation & Warehousing	4,817	14,369	26,894	56,716	4,550	107,346
Utilities	1,723	4,475	6,197	2,471	653	15,519
Information	4,395	8,014	143,400	10,391	2,616	168,816
Professional, Technical & Scientific	3,272	12,069	259,690	10,994	3,701	289,726
Management of Companies	962	1,207	52,267	1,798	905	57,139
Administrative Support Services	8,568	18,702	141,321	25,045	3,798	197,434
Health Care & Social Assistance	73,025	135,965	204,429	92,813	26,370	532,602
Arts, Entertainment & Recreation	2,823	3,211	47,671	4,233	1,118	59,056
Accommodation & Food Services	10,629	18,465	144,621	29,842	6,117	209,674
Other Services[(1)]	8,120	21,241	87,204	21,779	3,586	141,930
Unclassified & Other	1,384	5,018	8,325	4,587	823	20,137
State & Federal Government[(2)]	14,257	20,565	81,952	20,283	5,163	142,220
Total	203,516	432,077	1,893,130	473,439	89,324	3,091,486

Notes:
(1) Except public administration.
(2) Except local government agencies.

The employment categories, generation factors, tons generated in the City, and each category's percentage of total commercial waste generation are shown in Table 1.4-1.

Results generated by the model for the City are shown in Table 1.4-2 by employment category and tons of commercial waste by material. The origin of waste by borough was estimated from data collected by the Business Integrity Commission (BIC) and DSNY in November of 2003.

Although the model used in this analysis predicted 2002 citywide generation of commercial waste at a level similar to the 2003 BIC-DSNY survey, it would appear that the model is not as good an indicator at the borough or CD level. The 2002 estimated citywide commercial waste generation by the employment-based model is approximately 6% percent higher than the BIC-DSNY 2003 survey.

Table 1.4-1
Employment Categories, Commercial Waste Generation Factors and Tons Generated, and Category Percent of Total Commercial Waste Generation

Employment Category	Generation Factor Tons/Employee/Year	New York City 2002 Tons Generated	% of Commercial Waste Generation
Construction	0.44	51,400	1.6%
Finance & Insurance	0.44	146,770	4.5%
Real Estate Rental & Leasing	0.44	51,570	1.6%
Manufacturing	1.40	199,410	6.2%
Wholesale Trade	1.20	172,160	5.3%
Retail Trade	2.50	724,410	22.4%
Transportation & Warehousing	0.74	79,520	2.5%
Utilities	0.56	8,640	0.3%
Information	0.65	109,650	3.4%
Professional, Technical & Scientific	0.65	188,190	5.8%
Management of Companies	0.65	37,110	1.1%
Administrative Support Services	0.65	128,240	4.0%
Health Care & Social Assistance	0.63	419,530	12.9%
Arts, Entertainment & Recreation	3.40	46,090	1.4%
Accommodation & Food Services	3.40	710,340	21.9%
Other Services[1]	0.65	92,190	2.9%
Unclassified & Other	0.65	13,080	0.4%
State & Federal Government[2]	0.44	61,950	1.9%
Total New York City[3]		**3,240,250**	**100%**

Notes:
(1) Except public administration.
(2) Except local government agencies.
(3) Numbers may not add due to rounding.

Table 1.4-2
Commercial Waste Generation in New York City by Employment Category and by Material, 2002
(In Tons)

Employment Category	Paper	Plastics	Glass	Metals	Yard Wastes	Food Wastes	Other	Total Tons
Construction	39,580	2,570	1,540	1,540	520	4,110	1,540	51,400
Finance & Insurance	113,010	7,340	4,400	4,410	1,470	11,740	4,400	146,770
Real Estate Rental & Leasing	39,710	2,580	1,540	1,540	520	4,130	1,550	51,570
Manufacturing	93,720	27,920	2,000	9,970	1,990	43,870	19,940	199,410
Wholesale Trade	80,920	13,770	3,440	6,890	1,720	51,650	13,770	172,160
Retail Trade	456,380	50,710	21,730	28,980	7,240	130,390	28,980	724,410
Transportation & Warehousing	47,710	11,130	1,590	7,950	800	5,570	4,770	79,520
Utilities	5,790	1,040	430	600	90	520	170	8,640
Information	71,270	9,870	3,290	5,480	1,100	8,770	9,870	109,650
Professional, Technical & Scientific	122,320	16,940	5,650	9,410	1,880	15,050	16,940	188,190
Management of Companies	24,120	3,340	1,110	1,860	370	2,970	3,340	37,110
Administrative Support Services	83,360	11,540	3,850	6,410	1,280	10,260	11,540	128,240
Health Care & Social Assistance	255,910	33,560	8,390	20,980	4,200	46,150	50,340	419,530
Arts, Entertainment & Recreation	16,130	3,230	3,690	2,300	460	15,210	5,070	46,090
Accommodation & Food Services	248,620	49,720	56,830	35,520	7,100	234,410	78,140	710,340
Other Services[1]	59,920	8,300	2,760	4,610	920	7,380	8,300	92,190
Unclassified & Other	8,500	1,180	390	650	130	1,050	1,180	13,080
State & Federal Government[2]	47,700	3,100	1,860	1,860	620	4,950	1,860	61,950
Total Material[3]	**1,814,670**	**257,840**	**124,490**	**150,960**	**32,410**	**598,180**	**261,700**	**3,240,250**

Notes:

(1) Except public administration.

(2) Except local government agencies.

(3) Numbers may not add due to rounding.

On a borough level the employment model would predict more waste originating from Manhattan than the 2003 survey would suggest. An inherent problem with employment-based models is the assumption that all employees within an industry classification generate the same amount of waste (on a per employee basis). In reality, per-employee waste generation rates for a specific category of business are a function of the size of the business; generally, per-employee generation decreases as the number of employees increase. For example, on a per-employee basis, a five-employee office is likely to generate more waste per employee than an office with 50 employees.

New York State Department of Labor (NYSDOL) statistics show that, on average, Manhattan has more employees per firm than any of the other boroughs. Manhattan's finance and insurance industry averages 43 employees per firm, while the other boroughs average 13 or fewer employees per firm. Management companies average 72 employees per firm in Manhattan and 32 or fewer in the other boroughs. Therefore, the model predicts a higher quantity of waste originating from Manhattan than the BIC-DSNY survey.

Another drawback to using the employment model at the borough level is the disparity of job functions within each industry classification. For example, the health care and social assistance employment category includes employees that work in a medical office as well as employees that work in a hospital. Waste generation, on a per-employee basis, is higher for hospital employees. Due to lack of detail in the government employment statistics, the same waste generation factor was used for all employees within this category. The result is that the quantity of waste generated from a borough with a high number of hospital employees will be understated and the opposite would be true for a borough with a high concentration of medical offices.

The total tons generated in the City, distributed to the borough level, are shown in Table 1.4-3. The origin of commercial waste by borough percentages shown in this table are from the BIC-DSNY survey. Additionally, this table shows the number of employees (from Table 1.3-1) and an average commercial waste generation per employee factor for each borough.

Both drawbacks to using the employment-based model at the borough level are magnified when applied to the CD level. Therefore, to estimate waste generation, it was decided to apply the average factors developed for each borough (Table 1.4-3) to employment statistics on the CD level. Generation data for each borough by CD are shown in Tables 1.4-4 through 1.4-8.

Table 1.4-3
Commercial Waste Generation in New York City by Borough, 2002

Borough	Origin of Commercial Waste by Borough[1] Percentage	2002 Commercial Waste Generation[2] Tons/Year	2002 Employees by Borough[3] Number of Employees	Average Commercial Waste per Employee Tons/Employee/Year
Bronx	12.9%	417,990	203,516	2.05
Brooklyn	19.4%	628,610	432,077	1.45
Manhattan	42.3%	1,370,630	1,893,130	0.72
Queens	20.2%	654,530	473,439	1.38
Staten Island	5.2%	168,490	89,324	1.89
Total New York City	**100%**	**3,240,250**	**3,091,486**	**1.05**

Notes:
(1) 2003 BIC-DSNY 2003 carter survey.
(2) Borough totals derived from applying Origin of Commercial Waste by Borough Percentage to total City generation of 3,240,250.
(3) Table 1.3-1.

Table 1.4-4
Bronx
Commercial Waste Generation by Community District, 2002

Community District	2002 Number of Employees	2002 Commercial Waste Generation [(1)(2)] Tons/Year
1	21,110	43,360
2	15,544	31,930
3	9,293	19,090
4	19,076	39,180
5	9,883	20,300
6	13,037	26,780
7	24,896	51,130
8	15,121	31,060
9	16,359	33,600
10	16,284	33,440
11	23,741	48,760
12	19,172	39,380
Total Borough	**203,516**	**417,990**

Notes:
(1) Number of employees in each community district times borough average commercial waste generation factor.
(2) Numbers may not add due to rounding.

Table 1.4-5
Brooklyn
Commercial Waste Generation by Community District, 2002

Community District	2002 Number of Employees	2002 Commercial Waste Generation[(1)(2)] Tons/Year
1	40,768	59,310
2	75,904	110,430
3	18,168	26,430
4	12,556	18,270
5	22,575	32,840
6	26,850	39,060
7	25,750	37,460
8	10,643	15,480
9	11,867	17,260
10	22,153	32,230
11	21,195	30,840
12	33,738	49,080
13	13,044	18,980
14	22,932	33,360
15	24,708	35,950
16	8,356	12,160
17	17,716	25,770
18	23,154	33,690
Total Borough	**432,077**	**628,610**

Notes:
(1) Number of employees in each community district times borough average commercial waste generation factor.
(2) Numbers may not add due to rounding.

Table 1.4-6
Manhattan
Commercial Waste Generation by Community District, 2002

Community District	2002 Number of Employees	2002 Commercial Waste Generation[(1)(2)] Tons/Year
1	289,696	209,740
2	127,248	92,130
3	40,278	29,160
4	131,132	94,940
5	778,960	563,980
6	226,576	164,040
7	66,906	48,440
8	131,935	95,520
9	32,420	23,470
10	12,373	8,960
11	30,529	22,100
12	22,391	16,210
Central Park	2,686	1,940
Total Borough	**1,893,130**	**1,370,630**

Notes:
(1) Number of employees in each community district times borough average commercial waste generation factor.
(2) Numbers may not add due to rounding.

Table 1.4-7
Queens
Commercial Waste Generation by Community District, 2002

Community District	2002 Number of Employees	2002 Commercial Waste Generation[(1)(2)] Tons/Year
1	50,132	69,310
2	51,176	70,750
3	40,470	55,950
4	25,587	35,370
5	41,364	57,190
6	65,560	90,640
7	52,697	72,850
8	26,074	36,050
9	15,368	21,250
10	10,510	14,530
11	20,370	28,160
12	47,786	66,060
13	17,456	24,130
14	8,889	12,290
Total Borough	**473,439**	**654,530**

Notes:
(1) Number of employees in each community district times borough average commercial waste generation factor.
(2) Numbers may not add due to rounding.

Table 1.4-8
Staten Island
Commercial Waste Generation by Community District, 2002

Community District	2002 Number of Employees	2002 Commercial Waste Generation[(1)(2)] Tons/Year
1	48,122	90,770
2	27,682	52,220
3	13,521	25,500
Total Borough	**89,324**	**168,490**

Notes:
(1) Number of employees in each community district times borough average commercial waste generation factor.
(2) Numbers may not add due to rounding.

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ATTACHMENT 1

Methodology—"NYMTCBASEPROJ2024, JOBLOSS&REDISTR, CD&SECTOR, FINALFORMAT 9-29-03" (released 10-01-03)

Methodology—"NYMTCBASEPROJ2024, JOBLOSS&REDISTR, CD&SECTOR, FINALFORMAT 9-29-03" (released 10-01-03)

This memo describes the data collected for and the means of preparing the file "NYMTCBASEPROJ2024, JOBLOSS&REDISTR, CD&SECTOR, FINALFORMAT 9-29-03" (released 10-02-03 by e-mail distribution), which is a projection of industry-sector employment for each community district in New York City through the year 2025. Explanation of base employment projections and the need for and the means of adjusting these projections to make them suitable for DSNY waste quantification purposes follows.

As a fundamental component of the Commercial Waste Management Study (Study) undertaken by the New York City (City) Department of Sanitation (DSNY) per Local Law 74 (LL74), and as described in the "Commercial Waste Management Study Final Scope of Work" (July 31, 2003), DSNY must develop quantified commercial waste stream projections through the year 2024. To this end, an employment-based waste estimation model is being developed as part of the Study. Projections of employment, therefore, are necessary to estimate waste, and moreover, employment projections at the local level by industry sector are essential to calibrating the waste estimation model.

Early in 2001, the New York Metropolitan Transportation Council (NYMTC) prepared employment and population projections for the City through the year 2025, basing their projections on the most current employment and population data available at that time. The resultant NYMTC projections were prepared at county and census tract levels, extending to the year 2025. The categories of employment included total employment and total basic and total non-basic industries, as well as several "land use" categories (e.g., retail employment, office employment, etc.), which were pertinent to NYMTC tasks. While the population projections were in a suitable format for DSNY purposes, there was no industry sector breakdown of employment suitable for direct use in employment-based waste estimation. Moreover, these projections were being revised by NYMTC over the course of 2002 and 2003 to account for the effects of September 11.

The 2000 NYMTC projections of both population and employment were superceded in July 2003, when an interim update of the projections was published by NYMTC in a supplement to "Demographic and Socioeconomic Forecasting Post September 11 Impacts, Technical Memoranda 3.1 and 3.2," which reported the direct effects of September 11 -- both direct job loss in the City and geographic redistribution of employment within the City. These interim projections remained in the same format as the earlier projections (i.e., by counties and census tracts and using similar employment categories), but they accounted for the job loss and in-City geographic redistribution of employment directly attributable to September 11. Altogether new projections from base years more recent than 2000 are under preparation by NYMTC; however, at the time of this report, results were not available. Therefore, the interim projections have been utilized as the fundamental employment projection data on which the DSNY waste estimation model relies.

Additional modifications to these interim projections, however, have been undertaken by DSNY in order to reflect baseline (2002) conditions at the community district (CD) level and to distribute employment according to industry sectors. First, the projections, which were available at the census tract level, have been translated into CDs according to City Department of City Planning (NYCDCP) guidance. Second, the job loss resulting from the effects of economic recession in the City, which was not reflected in the NYMTC interim projections, has also been incorporated into the projections on which DSNY efforts rely. The methodologies employed by DSNY in making these adjustments to the NYMTC interim employment projections are outlined in greater detail below.

Description of NYMTC Interim Projections

The NYMTC interim projections of both population and total employment were modified by DSNY's Consultant for use in waste estimation modeling. These projections were prepared by NYMTC in five-year intervals from 2000 to 2025 (including a revised 2002 estimate), and a straight-line projection was assumed by the Consultant to derive projections for the year 2024 from the 2020 and 2025 projections. Both population and total employment projections at the census tract level were agglomerated into corresponding City CDs by the Consultant, using census tract-to-CD correspondence lists prepared by the NYCDCP.

The population projections were then suitable for use without requiring any further modification. However, the employment numbers required adjustment to address some limitations faced by the Consultant in utilizing the employment figures as they were prepared by NYMTC, which included the following:

- While citywide figures illustrating recession-related job loss were published, including the Comptroller's Report (PR03-70-071, July 17, 2003), this job loss was not recorded at the census tract level, which is necessary to revise the CD employment figures to be used in the waste estimation model.
- There were no industry-sector employment figures available from NYMTC (either as part of the interim projections or as part of other NYMTC data products) for geographic areas smaller than boroughs. Moreover, these borough-level sector breakdowns, while referring to several primary data sources, were published in 2001, using data from 2000; considering the employment changes assumed to have resulted since 2000, this sector distribution information was not desirable.

Methodology for Adjusting Interim Projections

The NYMTC projections, which have been developed by its various associated agencies, account for such factors as regional trends in the metro area. Moreover, they have been made readily available to DSNY and are in public use. The interim projections, which also account for in-City redistribution of jobs since September 11, are the only such projections to 2025 available at the census tract level, as is necessary to aggregate CD-level data and to generate employment projections for the Study target year, 2024. Therefore, in an effort to maximize the use of existing data, the Consultant adjusted these projections only as necessary and possible to better reflect existing employment conditions, according to currently available employment data.

The interim projections, once translated by the Consultant into CD-level geographies, were further adjusted: 1) to reflect 2000-2003 employment loss attributable to economic recession; and 2) to maintain as accurately as possible the distribution of employment by industry sector.

According to the City Comptroller's Report (July 2003), there was a decrease of 218,700 jobs (excluding 22,800 jobs lost in 2003 according to the report) in the City between December 2000 and December 2002, including the citywide number of jobs lost as a direct result of September 11.

Job Loss Since 2000

In order to create a revised baseline, both the NYMTC 2002 baseline number and New York State Department of Labor (NYSDOL) data (ES202) for 2002 have been utilized. The NYSDOL data, which provide the most current estimates of industry-sector employment distribution, though at the borough level, include a record only of insured employees, which in part results in the fact that the NYSDOL data report 398,951 fewer employees in the City as of 2002 than NYMTC reports as the revised baseline in their interim projections. This difference is much greater than expected based on the comptroller's July 2003 report, which reported a loss of 218,700 jobs between December 2000 and December 2002. Of additional concern in using NYSDOL data without the integration of NYMTC 2002 estimates is that the NYSDOL 2002 total employment for Manhattan was about 127,000 jobs more than the corresponding NYMTC figure.

Therefore, it was determined that the best use of both NYMTC data and NYSDOL data was to re-estimate 2002, beginning by reducing the NYMTC total 2000 employment by 218,700 jobs according to the comptroller's report, thus arriving at an adjusted 2002 total employment figure of 3.66 million. By adjusting 2000 data, rather than 2002, the direct losses resulting from September 11 are accounted for and a revised 2002 base is created by modifying NYMTC 2002 estimates on which the NYMTC projections are based.

Then the difference between this 2002 adjusted total City employment figure of 3.66 million and the NYSDOL fourth quarter 2002 total City employment (3.50 million) was determined to account for jobs not included within the NYSDOL estimates. This difference was added onto the 2002 NYSDOL estimates, to make borough-level NYSDOL estimates equal to NYMTC borough-level estimates.

Industry Sector Employment Distribution

Borough-level total employment was arranged to represent the same industry-sector percentage of total borough employment originally represented by the NYSDOL data. Then, the industry-sector employment at the borough level was distributed among the CDs such that total employment within each CD maintained the same CD-to-borough proportion as represented by the original NYMTC projections. Thus the NYMTC distribution of total employment at a geographic level smaller than the borough is maintained, while the approximations of industry sector employment distribution within the CDs are made according the patterns known for the borough. This resulting employment data are herein referred to as the "final adjusted" employment data.

The result is that within each CD a particular sector will represent the same percentage of total CD employment as in the other CDs in the same borough and the borough itself, overall. The actual numbers of jobs associated with a particular industry will vary among CDs, however, just as the total employment in each CD does.

Projections from 2002 to 2024

This new 2002 figure was then used as the new baseline to which the NYMTC growth rates were applied (different compound growth rates for each five-year interval, as derived from the interim projections, with an annualized compound growth rate utilized for 2002-2005). For each job classification, the final adjusted 2002 employment data for each CD is projected with these compound growth rates to future years. Although this method does not incorporate projected job loss and recovery beyond 2002, it does adjust the baseline to reflect known current conditions

(2002), providing for a smaller base from which to apply growth rates derived from the most current, applicable employment projections. Thus, the percentage distribution remains unchanged for all years in the future; however, the fundamental assumptions NYMTC and involved agencies made regarding total employment in preparing the model have been maintained.

APPENDIX C

COMMERCIAL PUTRESCIBLE WASTE - DISPOSED AND RECYCLED: BIC-DSNY CARTER SURVEY

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1.0 INTRODUCTION

The Business Integrity Commission (BIC) and the New York City (City) Department Of Sanitation (DSNY) collaborated on conducting a survey of private carters in the City during the period from October to November 2003. BIC is the City agency that regulates the private carter industry within the City. It maintains a registry of carters that are licensed to collect putrescible and non-putrescible (construction & demolition debris or C&D) waste, qualifies business entities to provide carting services and regulates the rates charged for collection. DSNY is responsible for preparing a 20-year Solid Waste Management Plan (New Plan) for the City, inclusive of the needs and requirements of the City's commercial waste management industry.

The purpose of the survey was to:

- Provide an independent source of data on the quantities of commercial putrescible waste collected by private carters that were generated within the City;
- Determine the amounts of commercial putrescible waste generated that were disposed and recycled by private carters;
- Obtain, to the extent practical, borough-level data, including the amount of putrescible waste, inclusive of recyclables, collected by carters in each borough; and
- Identify the specific transfer disposal or processing facilities used by haulers, truck shifts by borough, types of vehicles used and miles driven.

The data were collected for the six-month period extending from January through June of 2003. The data were annualized by multiplying the half-year statistics by two. Examination of tonnages disposed at DSNY-licensed putrescible Transfer Stations for the first and second halves of 2000, 2001 and 2002 indicated that a simple doubling of the first half's tonnage is the best method to obtain an annual estimate.

1.1 Survey Methodology

The survey, referred to as the "BIC survey," was carried out under the auspices of BIC by DSNY personnel and DSNY's Consultant. BIC provided a list of licensed putrescible haulers that was screened to eliminate firms known to be out of business or no longer conducting business within the City. BIC also provided data from its registry database, such as the number of licensed trucks operated by each carter, and each carter's customers by street address and zip code. The

total number of licensed putrescible waste haulers in the BIC registry was 165. Of this total, 41 were determined not to collect putrescible waste within the City; data from the remaining 124 firms were obtained and analyzed.

A two-step approach was used to implement the survey:

1. All haulers received a survey form by fax, with a cover letter, describing the purpose of the survey and imposing a three-day deadline for faxing back the requested data. (A copy of this form and cover letter is included in Attachment 1.) The data requested from each carter included: (i) the amount of putrescible waste collected by month, inclusive of waste disposed and recycled; and (ii) the transfer stations or disposal sites where putrescible waste was tipped, indicating the name, address, and the quantities disposed at each site. The same data was requested for recyclables collected by the hauler.

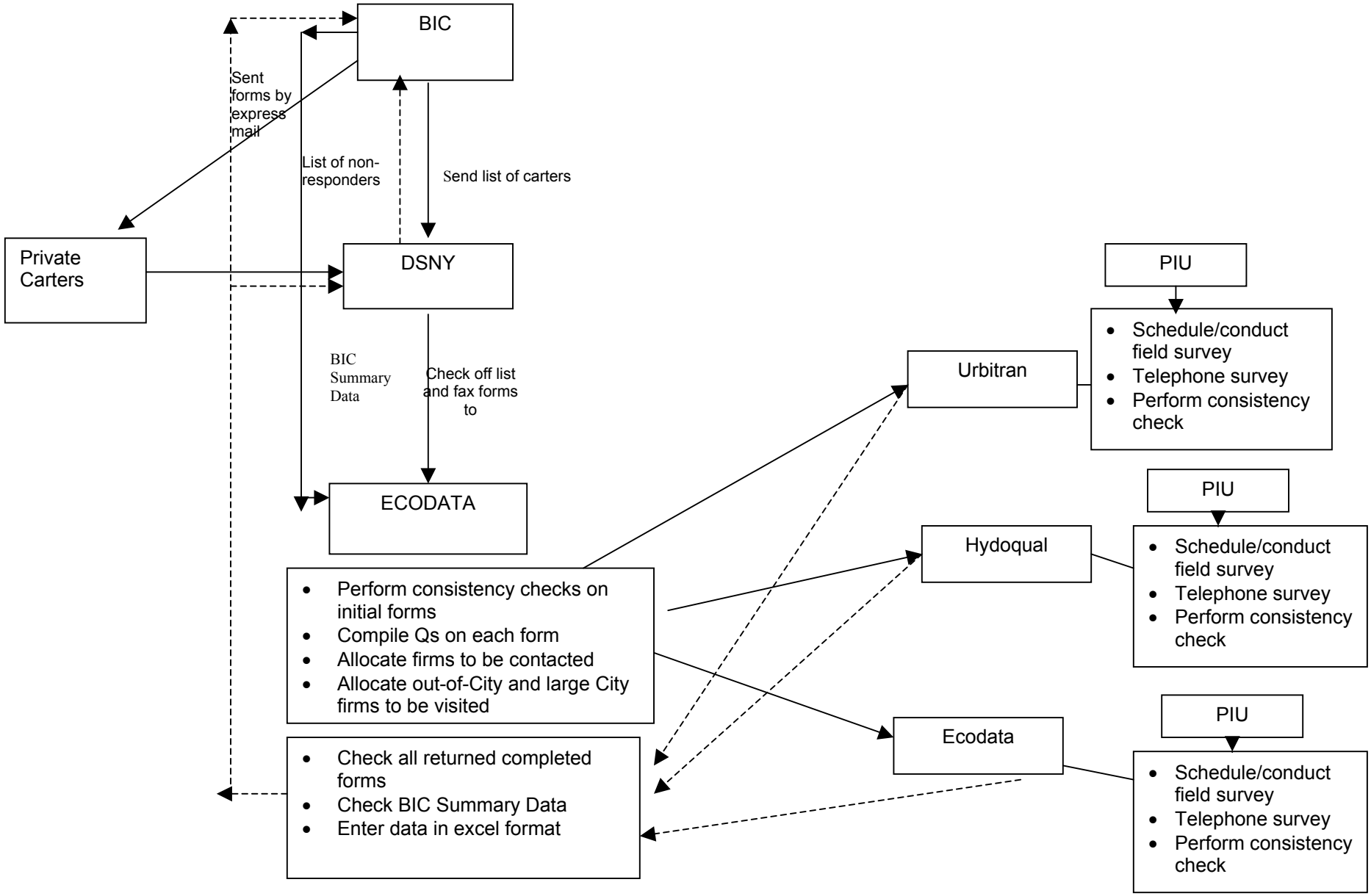
2. The information on the survey form was then corroborated and supplemented by a follow-up in-person or telephone interview with the collection company. Information gathered during these interviews included the number of truck shifts operated by the carter in each borough, the number of truckloads of refuse or recyclables picked up per shift, the types and sizes of vehicles used to pick up the refuse and recyclables, a listing of customers by borough, and the location where vehicles are parked. In-person field visits for on-site data collection were restricted to large firms, defined as those haulers with more than ten trucks. The remaining firms were contacted by telephone. Data were collected from 124 firms. (A copy of the interview questionnaire is included in Attachment 2.)

The initial survey data form was sent out during the week of October 13, 2003. Completed forms were returned by fax and initially processed by DSNY personnel. They were then checked for errors and consistency with information in the BIC registry by the DSNY Consultants.

The carter interviews occurred during the last week of October and the first two weeks of November 2003. DSNY's Consultants conducted the interviews with an inspector from DSNY's Permit and Inspection Unit (PIU) in attendance.

The data flow is summarized in the schematic in Figure 1.1-1. Interviewers filled out the interview form, checked the data for internal consistency and forwarded the form to the survey coordinator, who re-checked the calculations and entered the data into a spreadsheet for analysis.

FIGURE 1.1-1
FLOW DIAGRAM OF CARTER TELEPHONE AND FIELD SURVEY



2.0 SURVEY RESULTS

The results of the survey are summarized in Tables 2.1-1 through 2.5-1.

2.1 Collection Route Data

Table 2.1-1 breaks down the number of weekly truck shifts (defined as one truck collecting materials for one work-shift, multiplied by the number of times the truck collects per week), for putrescible waste generated, inclusive of waste disposed and recycled by borough and by type of vehicle. A total of 5,064 truck-shifts per week is required for collection of waste disposed, and 1,561 weekly truck shifts for waste recycled. For waste disposed, 41% of the truck shifts collect waste in Manhattan, 21% in Brooklyn, 20% in Queens, 14% in Bronx and 5% in Staten Island. Rear-loaders, with either a 25- or 30-cubic-yard capacity, comprise approximately three-fourths of the truck shifts for waste disposed.

With respect to recyclable waste, Manhattan again has the largest proportion of weekly truck-shifts (46%), followed by Brooklyn (25%), Queens (14%), Bronx (11%) and Staten Island (4%). Rear-loaders with 30- to 32-cubic-yard capacities and roll-offs are the vehicles most often used to collect recyclables.

2.2 Waste Generation

Data on total waste generation (disposed and recycled) is shown in Table 2.2-1. The data for the six-month period covered in the survey was annualized for these estimates, by multiplying by two. The estimated total quantity of commercial putrescible waste disposed of in 2003 is 2,244,318 tons and the estimated total amount of recyclables for the same period is 810,133 tons. The combined total of commercial waste and recyclables generated in 2003 is 3,054,451 tons. In terms of waste generation by borough, Manhattan contributes the largest proportion of the putrescible waste disposed - 41% or 926,587 tons. Brooklyn, Queens and Bronx produce fairly similar proportions of putrescible waste disposed -- Queens disposes 20% or 442,826 tons, Brooklyn disposes 19% or 420,874 tons, and Bronx disposes 14% or 317,914 tons. Staten Island disposes 6% or 136,117 tons.

Table 2.1-1
Weekly Truck Shifts for Commercial Putrescible Waste, 2003
(Number of Shifts per Week)[1]

	Manhattan	Brooklyn	Bronx	Queens	Staten Island	Total[2]
Waste Disposed						
Rear-load-25	747	391	206	263	50	1,657
Rear-load-30	930	447	212	438	102	2,129
Roll-Off	372	219	240	299	89	1,219
Other	16	1	38	4	0	59
Total[2]	2,065	1,058	696	1,004	241	5,064
Percent of Total Truck Shifts – Waste Disposed	41%	21%	14%	20%	5%	100%
Waste Recycled						
20-yard Compactor	15	3	0	0	0	18
25-yard Compactor	93	58	62	16	5	234
30- to 32-yard Compactor	450	211	58	140	28	887
Roll-Off	126	59	32.5	29	27	274
Other	36	51	25	36	0	148
Total[2]	720	382	178	221	60	1,561
Percent of Total Truck Shifts – Waste Recycled	46%	25%	11%	14%	4%	100%
Total Truck Shifts (Disposed & Recycled) [2]	2,785	1,440	874	1,225	301	6,625
Percent of Total Truck Shifts	42%	22%	13%	19%	5%	100%

Note:
[1] Truck shifts are rounded to the nearest whole number.
[2] Numbers may not add due to rounding.

Table 2.2-1
Annual Quantity of Commercial Putrescible Waste Collected in 2003 by Truck Type[1] (Tons)[2]

	Manhattan	Brooklyn	Bronx	Queens	Staten Island	Total Tons[3]
Waste Disposed						
Rear-load-25	311,189	152,347	73,748	101,611	25,756	664,651
Rear-load-30	418,375	158,560	107,895	206,326	45,933	937,089
Roll-Off	196,087	109,889	124,467	134,551	64,428	629,422
Other	936	78	11,804	338	0	13,156
Total[3]	926,587	420,874	317,914	442,826	136,117	2,244,318
Percent of Total Waste Disposed	41%	19%	14%	20%	6%	100%
Waste Recycled						
20-yard Compactor	3,224	936	0	0	0	4,160
25-yard Compactor	27,439	17,037	18,619	5,694	868	69,657
30- to 32-yard Compactor	224,864	79,862	20,113	126,175	10,524	461,538
Roll-Off	92,222	36,868	17,628	13,702	10,920	171,340
Other	18,707	37,978	19,006	27,747	0	103,438
Total[3]	366,456	172,681	75,366	173,318	22,312	810,133
Percent of Total Waste Recycled	45%	21%	9%	21%	3%	100%
Total Putrescible Waste Generated (Disposed & Recycled)[3]	1,293,043	593,555	393,280	616,144	158,429	3,054,451
Percentage Recycled of Total	28%	29%	19%	28%	14%	27%
Percentage Disposed of Total	72%	71%	81%	72%	86%	73%
Percentage of Total (Disposed & Recycled)	42%	19%	13%	20%	5%	100%

Notes:
(1) Annual estimate obtained by doubling the tonnages reported for the first six months.
(2) Tons are rounded to the nearest whole number.
(3) Numbers may not add due to rounding.

The predominance of office sector employment in Manhattan is reflected by its relatively higher contribution -- 45%, or 366,456 tons -- to putrescible recycled waste, the dominant portion of which is office paper. Brooklyn and Queens each account for 21% of the recycled tons, approximately the same as their proportions of waste. Although the share of Bronx waste disposed is approximately 14%, it recovers only 9% of the recyclable tonnages. Similarly, Staten Island's share of waste disposed is approximately 6% but its share of waste recycled is only 3%. These differences can be partially explained by the difference in the smaller proportion of office sector employment and the smaller size of Bronx and Staten Island business establishments, compared to other boroughs.

In total, the overall commercial recycling rate (tons recycled/total tons generated) is 27%. Brooklyn, Manhattan and Queens all have recycling rates in the 28% - 29% range. Bronx and Staten Island have recycling rates of 19% and 14%, respectively.

Of the total quantity of 3,054,451 tons of waste generated by the commercial sector, Manhattan generates 42%, Queens 20%, Brooklyn 19%, Bronx 13% and Staten Island 5%.

While Manhattan generates 42% of the waste (as shown in Table 2.2-1), it has 37% of the 118,117 customers, as shown in Table 2.2-2. Brooklyn has 29% of the customers, generating 19% of the waste, while Queens has 20% of the customers, generating 20% of the waste. Bronx has approximately 11% of the customers generating approximately 13% of the waste, and Staten Island has approximately 4% of the customers generating approximately 5% of the waste.

Table 2.2-2
Number of Customers by Borough

	Manhattan	Brooklyn	Bronx	Queens	Staten Island	Total
# of Customers	44,116	34,043	12,649	23,093	4,270	118,171
% of Total Customers	37%	29%	11%	20%	4%	100%

2.3 Commercial Waste Transport

Commercial refuse collection vehicles collectively drive millions of miles on City streets in any given year. Tables 2.3-1, 2.3-2 and 2.2-3 break down mileage by time of day, type of truck and type of waste for vehicles in each borough. Table 2.3-1 shows the mileage driven during the day. For purposes of this Study, a night shift is defined as one in which trucks collect waste generally between 6:00 p.m. and 6:00 a.m. A day shift is considered to be one in which waste is collected generally between 6:00 a.m. and 6:00 p.m. Table 2.3-2 shows mileage driven at night and Table 2.3-3 shows the total number of miles driven.

During the day, about 1.1 million miles were driven by putrescible waste collection trucks. Of this amount, the largest proportion of miles, or almost 90%, was logged by roll-offs. This is due to the fact that roll-off vehicles often drive significant distances between customers, as each box is individually hauled to the tip location, then returned to the customer, and as boxes may be scattered in many different locations. Thirty-six percent (36%) of the number of total miles driven during the day for putrescible waste collection are driven in Manhattan, with 20% in Queens, 19% in Bronx, 16% in Brooklyn and only 9% in Staten Island.

With respect to recyclables collection, 363,621 miles were driven by recycling vehicles servicing commercial customers during the day in 2003. By borough, most of these miles (approximately 41%) were driven in Manhattan, followed by Brooklyn (26%), Bronx (15%), Queens (14%) and Staten Island (4%).

While 1.4 million miles in total were driven during the day by refuse collection and recyclables collection vehicles picking up commercial waste in 2003, about six times that amount, or 8.2 million miles, were driven at night. Carters can operate more efficiently at night, when there is minimal interference from traffic and most businesses have ceased operations. As shown in Table 2.3-2, 4.8 million miles were driven by putrescible waste collection vehicles at night and 3.4 million miles were driven by vehicles collecting recyclables. The highest percentage of nighttime miles are driven in Manhattan (43%) and the lowest in Staten Island (6%).

Table 2.3-1
Commercial Putrescible Waste
Annual Miles Driven by Collection Trucks During the Day, 2003[(1)(2)(3)]
(Miles/Year)

	Manhattan	Brooklyn	Bronx	Queens	Staten Island	Total
Waste Disposed						
Rear-load-25	49,749	27,472	11,684	22,505	4,686	116,096
Rear-load-30	29,684	10,287	5,995	13,421	4,468	63,855
Roll-Off	306,942	130,301	183,520	180,797	87,071	888,631
Other	3,138	94	4,488	345	0	8,065
Total	389,513	168,154	205,687	217,068	96,225	1,076,647
Percent of Total Day Miles	36%	16%	19%	20%	9%	100%
Waste Recycled						
20-yard Compactor	5,009	1,092	0	0	0	6,101
25-yard Compactor	23,583	15,962	17,374	6,691	2,640	66,250
30- to 32-yard Compactor	32,596	14,935	6,036	13,293	2,945	69,805
Roll-Off	71,592	37,219	19,477	11,339	9,338	148,965
Other	15,562	25,875	11,110	19,953	0	72,500
Total	148,342	95,083	53,997	51,276	14,923	363,621
Percent of Total Day Miles	41%	26%	15%	14%	4%	100%
Total Day Miles (Disposed & Recycled)	537,855	263,237	259,684	268,344	111,148	1,440,268
Percentage of Total Day Miles	37%	18%	18%	19%	8%	100%

Notes:
(1) Miles are rounded to the nearest whole number.
(2) Day shifts are those in which trucks collect waste generally between 6:00 a.m. and 6:00 p.m.
(3) Numbers may not add due to rounding.

Table 2.3-2
Commercial Putrescible Waste
Annual Miles Driven in Each Borough During the Night, 2003[(1)(2)(3)]
(Miles/Year)

	Manhattan	Brooklyn	Bronx	Queens	Staten Island	Total
Waste Disposed						
Rear-load-25	704,030	388,769	165,352	318,485	66,320	1,642,956
Rear-load-30	959,642	332,610	193,828	433,935	144,460	2,064,475
Roll-Off	353,432	150,036	211,316	208,182	100,259	1,023,225
Other	22,862	686	32,692	2,515	0	58,755
Total	2,039,966	872,101	603,188	963,117	311,039	4,789,411
Percent of Total Night Miles	43%	18%	13%	20%	7%	100%
Waste Recycled						
20-yard Compactor	25,047	5,460	0	0	0	30,507
25-yard Compactor	145,500	98,482	107,192	41,284	16,288	408,746
30- to 32-yard Compactor	868,018	397,700	160,728	353,996	78,435	1,858,877
Roll-Off	347,008	180,400	94,403	54,961	45,262	722,034
Other	83,498	138,835	59,610	107,057	0	389,000
Total	1,469,071	820,877	421,933	557,298	139,985	3,409,164
Percent of Total Night Miles	43%	24%	12%	16%	4%	100%
Total Night Miles (Disposed & Recycled)	3,509,037	1,692,978	1,025,121	1,520,415	451,024	8,198,575
Percentage of Total Night Miles	43%	21%	13%	19%	6%	100%

Notes:
(1) Miles are rounded to the nearest whole number.
(2) Night shifts are those in which trucks collect waste generally between 6:00 p.m. and 6:00 a.m.
(3) Numbers may not add due to rounding.

Table 2.3-3
Commercial Putrescible Waste
Annual Miles Driven Day and Night in Each Borough, 2003[1][3]
(Miles/Year)

	Manhattan	Brooklyn	Bronx	Queens	Staten Island	Total	Percent of Miles at Night[2]
Waste Disposed							
Rear-load-25	753,779	416,241	177,036	340,990	71,006	1,759,052	93.40%
Rear-load-30	989,326	342,897	199,823	447,356	148,928	2,128,330	97.00%
Roll-Off	660,374	280,337	394,836	388,979	187,330	1,911,856	53.52%
Other	26,000	780	37,180	2,860	0	66,820	87.93%
Total	2,429,479	1,040,255	808,875	1,180,185	407,264	5,866,058	83.06%
Percent of Total Miles	41%	18%	14%	20%	7%	100%	
Waste Recycled							
20-yard Compactor	30,056	6,552	0	0	0	36,608	83.33%
25-yard Compactor	169,083	114,444	124,566	47,975	18,928	474,996	86.05%
30- to 32-yard Compactor	900,614	412,635	166,764	367,289	81,380	1,928,682	96.38%
Roll-Off	418,600	217,620	113,880	66,300	54,600	871,000	82.90%
Other	99,060	164,710	70,720	127,010	0	461,500	84.29%
Total	1,617,413	915,961	475,930	608,574	154,908	3,772,786	90.36%
Percent of Total Miles	43%	24%	13%	16%	4%	100%	
Total Miles (Disposed & Recycled)	4,046,892	1,956,216	1,284,805	1,788,759	562,172	9,638,844	
Percentage of Total Miles	42%	20%	13%	19%	6%	100%	

Notes:
[1] Miles are rounded to the nearest whole number.
[2] Night shifts are those in which trucks collect waste generally between 6:00 p.m. and 6:00 a.m.
[3] Numbers may not add due to rounding.

With respect to nighttime mileages attributed to the collection of recyclables, the largest proportion, or 43% of the 3.4 million miles driven, occurs in Manhattan. Trucks picking up recyclables at night in Brooklyn contribute 24% of miles, 16% in Queens and 12% in Bronx. Due to its small size, Staten Island comprises only 4% of the nighttime miles driven for recyclable pick-up by haulers.

Table 2.3-3 consolidates the day and nighttime miles driven data, showing in aggregate that commercial sector waste collection and recycling operations involve approximately 10 million miles annually. The table provides break-downs by borough and by waste disposal and recycling routes. As shown in the final column of the table, most driving across all truck classifications and for both putrescible and recyclable pick-up, is done at night -- more than 85% of all mileage is driven at night. The one exception is roll-off containers for refuse pick-up. In this case, about 54% of the miles driven are at night. This is due to the fact that customers call for box pick-up when the box is full, which may be at any time. Routes are scheduled for both day and night pick-up, depending on the customer.

2.4 Recovered Recyclables By Type

Table 2.4-1 shows weekly truck-shifts by borough by recyclable material type. As indicated in the last column of the table, nearly all the weekly truck shifts, or about 92%, are devoted to mixed office paper (MOP) and old corrugated cardboard (OCC) recycling. Approximately 4% of the truck shifts are dedicated to sorted office paper and 2% to old newsprint (ONP). Other materials collected in smaller quantities are textiles and wooden pallets, each of which accounts for 1% of the truck shifts. Collectively, organics, bakery waste, bottles and cans, plastic bags and metals make up 1% of the truck shifts (and are reported in one category as "Other"). Nearly one-half the weekly recycling truck shifts (46%) are in Manhattan. The next highest proportion is Brooklyn with 24%. Queens and Bronx contribute 14% and 11%, respectively, and Staten Island has the lowest percentage at 4%.

Table 2.4-1
Commercial Putrescible Waste
Weekly Truck Shifts for Recycled Waste by Borough, 2003[1][3]
(Shifts/Week)

Material	Manhattan	Brooklyn	Bronx	Queens	Staten Island	Total	Percent of Total Truck Shifts
Mixed Office Paper	438	173	60	86	4	761	48%
Old Corrugated Cardboard	234	181	112	109	49	685	44%
Sorted Office Paper	25	9	4	12	7	57	4%
Newspaper	16	6	3	6	0	31	2%
Textiles	5	5	0	5	0	15	1%
Wooden Pallets	8	3	0	0	0	11	1%
Other [2]	4	8	0	4	0	16	1%
Total	730	385	179	222	60	1,576	100%
Percent of Total Truck Shifts	46%	24%	11%	14%	4%	100%	

Notes:
(1) Truck shifts are rounded to the nearest whole number.
(2) "Other" includes organics, bakery waste, bottles and cans, plastic bags and metals.
(3) Numbers may not add due to rounding.

The total quantity of recyclables collected by licensed carters from the commercial sector in the City in 2003 was 810,133 tons. As shown in Table 2.4-2, 98% of this amount was various types of paper. The major categories of paper collected were MOP -- 441,341 tons -- and OCC -- 316,600 tons. Less than 5,000 tons of material reported as "Other," including metal, glass and plastic (MGP), were collected from commercial waste generators.

In Manhattan, MOP makes up 73% of the tonnage collected and OCC comprises 22% of this stream. In Brooklyn, MOP drops to 57%. In Bronx, this percentage is 37%; in Queens, 27%; and in Staten Island, 5%. OCC constitutes about one-third of the recyclables picked up in Brooklyn. However, in Bronx, Queens and Staten Island, it is the largest portion of the recyclable stream, ranging from 60% in Bronx, to 66% in Queens, to 91% on Staten Island. For sorted office paper and ONP, percentages mimic the citywide numbers. The exception is sorted office paper on Staten Island, which constitutes approximately 7% of the recyclable amounts collected; citywide; this percentage is only 2%.

The differences in composition are related to the nature of commercial activity in each of the boroughs. Manhattan, with its high-density office buildings, naturally generates a high proportion of MOP. Commercial entities in the outer boroughs tend to be food stores, small delis and light manufacturing, which tend to generate a higher percentage of OCC as compared to MOP.

Table 2.4-2
Commercial Putrescible Waste
Tons of Recycled Waste, 2003[(1)(2)(3)]
(Tons/Year)

Material	Manhattan	Brooklyn	Bronx	Queens	Staten Island	Total	Percent of Total Tons
Mixed Office Paper	266,709	98,774	28,746	46,176	936	441,341	55%
Old Corrugated Cardboard	78,761	58,929	44,597	114,543	19,770	316,600	39%
Sorted Office Paper	8,528	4,004	1,040	4,628	1,456	19,656	2%
Newspaper	4,498	3,432	650	3,432	0	12,012	2%
Textiles	3,640	3,640	0	3,640	0	10,920	1%
Wooden Pallets	4,719	39	0	0	0	4,758	1%
Organics	0	655	0	655	0	1,310	<1%
Bakery Waste	0	2,808	0	0	0	2,808	<1%
Bottles and Cans	312	0	0	0	0	312	<1%
Plastic Bags	156	156	0	0	0	312	<1%
Metal	104	0	0	0	0	104	<1%
Total	367,427	172,437	75,033	173,074	22,162	810,133	100%
Percent of Total Tons	45%	21%	9%	21%	3%	100%	

Notes:
(1) Tons are rounded to the nearest whole number.
(2) Attachments 3 and 4 contain an expanded version of this table, including recycling from two other sources: returns of deposit containers and materials separated for recycling from mixed loads delivered to Transfer Stations in the City.
(3) Numbers may not add due to rounding.

2.5 Destination of Commercial Putrescible Waste

Table 2.5.1 presents annual commercial putrescible waste generation, disposed and recycled, according to borough of origin, and destination according to geographic location where the collection vehicles are first tipped. The generation data is derived from the interviews with the collection companies, based on detailed information about truck routes in each of the five boroughs. These data have been discussed previously (see Table 2.2-1). In the aggregate, 3,054,451 tons of waste disposed and recycled are generated in the five boroughs.

The destinations of the disposed and recycled wastes are derived from the tipping records faxed to DSNY in response to the BIC Directive dated October 9, 2003. The total tonnages are disaggregated even further in Table 2.5.2 according to the specific Transfer Station within the City to which the putrescibles were delivered. Table 2.5.3 presents further detailed information on waste disposed, which was first tipped at transfer stations or disposal facilities located outside the City limits. These data are presented in tons per day and annual tons.

Tables 2.5-2 and 2.5-3 summarize data collected from the carter survey on the in-City and out-of-City destinations of commercial putrescible waste disposed by the City's carters. (The in-City Transfer Station totals do not include DSNY-managed Waste disposed under Interim Export Contracts.) Note that these data vary somewhat from the totals given for DSNY's Quarterly Transfer Station Reports (Quarterly Reports) in Volume II, Appendix A, Facilities Estimate of Putrescible Waste Generation Year 2002. However, the differences are not very large, and the distributions shown by the BIC-DSNY survey compare in magnitude to those appearing in the DSNY's Quarterly Reports. This is supportive of the accuracy of the data obtained in this survey of collection companies. The Volume II Summary Report provides a comparison of these data.

Table 2.5-1
Origins and Destinations of New York City's Commercial Putrescible Waste, 2003[(1)]

	Waste Disposed		Waste Recycled		Disposed & Recycled	
	Tons	**% of Total**	**Tons**	**% of Total**	**Tons**	**% of Total**
ORIGINS						
Manhattan	926,587	41%	367,427	45%	1,294,014	42%
Brooklyn	420,874	19%	172,437	21%	593,311	19%
Bronx	317,914	14%	75,033	9%	392,947	13%
Queens	442,826	20%	173,074	21%	615,900	20%
Staten Island	136,117	6%	22,162	3%	158,279	5%
New York City	*2,244,318*	*100%*	*810,133*	*100%*	*3,054,451*	*100%*
DESTINATIONS						
Manhattan	0	0%	0	0%	0	0%
Brooklyn	730,340	35%	211,457	30%	941,797	34%
Bronx	769,700	37%	68,326	10%	838,026	30%
Queens	279,407	13%	76,752	11%	356,159	13%
Staten Island	0	0%	72,120	10%	72,120	3%
New York City	*1,779,447*	*85%*	*428,655*	*61%*	*2,208,102*	*79%*
Out-of-City:						
Long Island	29,768	1%	20,632	3%	50,400	2%
Westchester	7,977	0%	580	0%	8,557	0%
New Jersey	273,999	13%	256,090	36%	530,089	19%
Other	12,404	1%	69	0%	12,473	0%
Total Out-of-City	*324,148*	*15%*	*277,371*	*39%*	*601,519*	*21%*
Grand Total	**2,103,595**	**100%**	**706,026**	**100%**	**2,809,621**	**100%**
Percent difference	6.69%		14.75%		8.71%	

Notes:
(1) Numbers may not add due to rounding.
Source: Origins = BIC-DSNY survey interviews.
Destinations = Fax-Back BIC-DSNY survey.

Table 2.5-2
BIC-DSNY Carter Survey Responses
In-City Destinations of Waste Disposed

In-City Commercial Transfer Stations				2003 CARTER SURVEY RESULTS Waste Disposed (Tons per Day)
Putrescible Stations	**Address**	**Borough**	**BIC Code**	
IESI (Atlantic) (Solid Waste Mgt. Corp.)	110 50th St.	BKLYN	***D11***	**94**
Browing Ferris (Thames St.) (Waste Management)	115 Thames St.	BKLYN	***D8***	**427**
Browning Ferris (J.L.J. Recycling)	598 Scholes St.	BKLYN	***D9***	**178**
Hi-Tech	130 Varick Ave.	BKLYN	***D10***	**367**
Waste Serv. N.Y. (Allied) (Rutigliano)	941 Stanley Ave.	BKLYN	***D15***	**44**
IESI (Waste Mgt. of NYC) (N. Vaccaro)	577 Court St.	BKLYN	***D12***	**248**
Waste Mgt. of NYC (N.Y. Acq.) (B.Q.E. Service)	485 Scott Ave.	BKLYN	***D14***	**22**
Waste Mgt. of NYC (N.Y. Acq.) (Star)	215 Varick	BKLYN	***D13***	**961**
			Brooklyn Subtotal:	**2,341**
			Percent of Total:	**41%**
IESI (Casanova St. Proc.)	325 Casanova St.	BRONX	***D1***	**200**
Metropolitan Transfer Station	287 Halleck St.	BRONX	***D2***	**743**
Paper Fibers Corp.	960 Bronx River Ave.	BRONX	***D3***	**1**
U.S.A. Waste of New York City (Harlem River Yard)	132nd St.	BRONX	***D4***	**223**
U.S.A. Waste of New York City	98 Lincoln Ave.	BRONX	***D5***	**679**
Republic Ser. (Waste Mgt. of NYC Oakpoint)	Oakpoint Ave.	BRONX	***D6***	**45**
Waste Ser. of NY (Waste Mgt. of NYC) (S.P.M.)	920 E. 132 St.	BRONX	***D7***	**576**
			Bronx Subtotal:	**2,467**
			Percent of Total:	**43%**
A&L Cesspool	38-40 Review Ave.	QUEENS	***D16***	**0**
Cross County	122-52 Montauk St.	QUEENS	***D18***	**27**
Crown (Five Counties)	172-33 Douglas Ave.	QUEENS	***D17***	**618**
New Style	49-10 Grand Ave.	QUEENS	***D19***	**38**
Regal Recycling	172-02 Douglas Ave.	QUEENS	***D20***	**206**
Waste Mgt. of NYC Qns. (Review Ent.)	38-50 Review Ave.	QUEENS	***D22***	**0**
Tully Environment Inc.	127-20 34th Ave.	QUEENS	***D21***	**6**
			Queens Subtotal:	**895**
			Percent of Total:	**16%**
			Putrescible Total:	**5,703**

Table 2.5-3
BIC-DSNY Carter Survey Responses
Out-of-City Destinations of Waste Disposed[1]

Out-of-City Disposal Sites From Carter Survey Form	State	Fax-Back Total Tons 2003	Fax-Back Tons/Day 2003	Percent of Exported Waste
WESTERN NEW JERSEY GROUP				
Covanta, Warren County	NJ			
Warren County Landfill, Union, NJ	NJ			
PCFA,Oxford, NJ	NJ			
Waste Management Hunterdon County, NJ	NJ			
BFI, Fairview, NJ	NJ			
Bridgewater Resources, Somerset	NJ			
Union County Disposal, Union County, NJ	NJ			
Subtotal		**144,013**	**462**	**NA**
NEWARK FACILITIES				
Recycling & Salvage, Newark, NJ	NJ			
American Refuel, Newark, NJ	NJ			
Hi Tech, Newark, NJ	NJ			
DJM South Kearny, NJ	NJ			
NJMC, Arlington, NJ	NJ			
Subtotal		**51,935**	**166**	**NA**
NEAR STATEN ISLAND				
Automated Modular Systems, Linden, NJ	NJ			
Waste Management Julia St., Elizabeth	NJ			
SWTR, Elizabeth, NJ	NJ			
Subtotal		**51,389**	**165**	**NA**
NORTH METRO AREA				
Onyx, Totowa, NJ	NJ			
Garafola Transfer Station, Garfield, NJ	NJ			
Waste Management of NJ, Fairlawn NJ	NJ			
Allegro Sanitation, Secaucus, NJ	NJ			
Subtotal		**4,794**	**15**	**NA**

Table 2.5-3 (continued)
BIC-DSNY Carter Survey Responses
Out-of-City Destinations of Waste Disposed[1]

Out-of-City Disposal Sites From Carter Survey Form	State	Fax-Back Total Tons 2003	Fax-Back Tons/Day 2003	Percent of Exported Waste
SOUTHERN NEW JERSEY				
Midco, New Brunswick, NJ	NJ			
Camden County	NJ			
Woodhur Ltd, Wrightstown, NJ	NJ			
Subtotal		**21,868**	**70**	
NEW JERSEY TOTAL		**273,999**		**85%**
NEW YORK STATE				
American Refuel, Westbury, NY	NY			
Capital Compost, Menands, NY	NY			
Town of North Hempstead	NY			
Waste Management, Yonkers, NY	NY			
BFI Suburban, Westchester, NY	NY			
Sanitary District #1, Lawrence, NY	NY			
A1 Compaction, Yonkers, NY	NY			
Winter Brothers, West Babylon, NY	NY			
RIC, Mamaroneck, NY	NY			
Wheelabrator, Westchester, Peekskill, NY	NY			
Subtotal		**39,782**	**128**	**12%**
OTHER LOCATIONS				
Better Management Corp. of Ohio	OH			
American Ref Fuel, Chester, PA	PA			
Subtotal		**10,366**	**33**	**3%**
Total		**324,147**		**100%**
Facilities Not in Fax-Back Form				
Pen Pac Fulton	NJ			
Onyx Robros	NJ			

Notes:
(1) Numbers may not add due to rounding.
NA = Not applicable.

Table 2.5-2 shows daily tons arriving at each of the DSNY's licensed putrescible Transfer Stations, obtained from the disposal information faxed by each of the licensed putrescible collection firms surveyed by BIC-DSNY. All data concerned disposed tons for the period January to June, 2003. The data were converted to tons per day by dividing the aggregate for the six months by 156 days. Forty-one percent (41%) of in-City disposed tons (the tons are tipped in-City, but then are transported outside the City for final disposal) are tipped in Brooklyn, 43% are tipped in Bronx and 16% are tipped in Queens. There were no putrescible Transfer Stations operating in Manhattan or Staten Island during the first half of 2003.

Direct export of putrescible solid waste occurs when the collection vehicle first tips its load at a transfer station or disposal facility located outside the City boundaries. Table 2.5-3 displays the out-of-City disposal of commercial waste, as reported by the licensed collection companies. Most of the companies that directly export waste are themselves located outside the City; their trucks tip at a disposal facility near their firm's deployment location. As many firms from New Jersey collect waste in the City, and, particularly, in Manhattan, it is not surprising that the majority of directly exported waste is tipped in New Jersey; New Jersey receives 85% of the waste that is directly exported from the City. In 2003, the DSNY's Consultants estimate that 324,147 tons were directly exported from the City, based upon the results from the fax-back survey. Thus, New Jersey received just under 275,000 tons from the City. New York State outside the City, including Long Island and Westchester Counties, received 12% of directly exported commercial putrescible waste, and 3% went to other locations (Pennsylvania and Ohio).

The out-of-City disposed waste going to New Jersey is concentrated in those areas near the City. Over 50% goes to counties in western New Jersey, including Warren, Hunterdon and Union Counties. An additional 19% of the waste going to New Jersey goes to facilities in Newark and another 19% to facilities located in proximity to Staten Island. The remaining 8% of the waste is delivered to scattered locations, including southern New Jersey and the north Metro Area.

2.6 Garaging of Collection Vehicles

Table 2.6-1 shows where the haulers park their refuse and recycling vehicles and whether the vehicles are parked outdoors or indoors, by community district (CD). About 44% of the 823 vehicles reported in the survey are parked indoors. The largest proportion, 40%, are parked in Brooklyn. This location is followed by Bronx, in which 19% of the vehicles are parked, Queens 18%, and New Jersey with 14%. Manhattan and Staten Island each have 3% of the vehicles. Nassau and Suffolk Counties together have 2% and Westchester County has 2%. Overall, about 82% of all the refuse and recyclable collection vehicles servicing the commercial sector in the City are parked within City limits, with 18% parked outside the City limits.

Table 2.6-1
Truck Parking by Borough, Community District, Town &/or Zip Code, 2003

Borough, Community District, Town, &/or Zip Code	Number Parked Indoors (Number of Trucks)	Total Trucks	Percentage of Trucks in CD/Town	Percentage of Total Trucks (In and Out of City)
Manhattan				
CDs 4,5 – 10001	0	18	86%	
CDs 10,11 – 10035	0	3	14%	
Total Manhattan	0	21	100%	3%
Brooklyn				
CDs 2,6 – 11201	0	9	3%	
CDs 9,7,18 – 11203	0	3	1%	
CDs 1,2,3 – 11205	4	4	1%	
CDs 1,3,4 – 11206	8	11	3 %	
CDs 5,9,10 – 11208	0	24	7%	
CDs 14,15,17,18 – 11210	3	3	1%	
CDs 3,8,9,17 – 11213	3	3	1%	
CDs 11,13 – 11214	2	2	1%	
CDs 6,7,9,14 – 11215	11	14	4%	
CDs 2,6,8 – 11217	4	7	2%	
CDs 7,10,11,12 – 11219	11	11	3%	
CDs 7,10,12 – 11220	0	1	>1%	
CD 1 – 11222	9	32	10%	
CD 6 – 11231	16	21	6%	
CDs 7,12 – 11232	18	18	5%	
CDs 5,16,17,18 – 11236	9	10	3%	
CDs 1,4 – 11237	5	159	48%	
Total Brooklyn	103	332	100%	40%
Bronx				
CDs 1,3,4 – 10451	54	54	35%	
CDs 1,2 – 10454	6	6	4%	
CDs 9,11 – 10461	2	2	1%	
CDs 6,9,10,11 – 10462	12	15	10%	
CDs 10,11 – 10465	0	3	2%	
CDs 7, 8,11,12 – 10467	6	6	4%	
CDs 10,11,12 – 10469	0	2	1%	
CDs 2,9,10 – 10473	2	4	3%	
CD 2 – 10474	39	62	40%	
CDs 12 – 11466	0	1	1%	
Total Bronx	121	155	100%	19%

Table 2.6-1 (Continued)
Truck Parking by Borough, Community District, Town &/or Zip Code, 2003

Borough, Community District, Town, &/or Zip Code	Number Parked Indoors (Number of Trucks)	Total Trucks	Percentage of Trucks in CD/Town	Percentage of Total Trucks (In and Out of City)
Queens				
CDs 1,2 – 11101	5	5	3%	
CD 1 – 11102	2	4	3%	
CD 1 – 11105	4	12	8%	
CD 1 – 11106	0	1	1%	
CDs 1,3 – 11370	1	2	1%	
CDs 1,2,3,4,5 – 11377	1	1	1%	
CD 5 – 11378	3	23	16%	
CD 5 – 11385	13	20	14%	
CDs 8,12 – 11423	1	21	14 %	
CDs 8,12 – 11432	10	10	7%	
CD 12 – 11433	18	23	16%	
CDs 12,13 – 11434	5	24	16%	
Total Queens	63	146	100%	18%
Staten Island				
CD 1 - 10302	3	6	29%	
CD 1 – 10310	12	12	57%	
CDs 1,2,3 – 10314	0	3	14%	
Total Staten Island	15	21	100%	3%
New York City Total	302	675	82%	82%
New Jersey				
Newark – 07104	0	8	7%	
Newark – 07114	17	17	15%	
Jersey City – 07305	0	2	2%	
Hackensack – 07601	0	4	4%	
Jersey City - 07304	0	2	2%	
Jersey City - 07305	0	10	9%	
Jersey City - 07307	9	14	12%	
Hoboken - 07030	2	3	3%	
Lyndhurst, Kearny - 07071	0	14	12%	
Kearny - 07032	0	8	7%	
Elizabeth - 07201	2	4	4%	
East & South Brunswick, Sayerville - 08816	5	5	4%	
North Bergen - 07047	0	8	7%	

Table 2.6-1 (Continued)
Truck Parking by Borough, Community District, Town &/or Zip Code, 2003

Borough, Community District, Town, &/or Zip Code	Number Parked Indoors (Number of Trucks)	Total Trucks	Percentage of Trucks in CD/Town	Percentage of Total Trucks (In and Out of City)
Clifton - 07014	8	8	7%	
Secaucus - 07094	0	4	4%	
Millstone, Monroe, Englishtown, Marlboro, Manalapan - 07726	0	2	2%	
Total New Jersey	43	113	100%	14%
Nassau & Suffolk Counties				
Babylon, Suffolk – 11704	0	8	47%	
Babylon, Suffolk – 11757	0	1	6%	
Hempstead, Nassau – 11096	0	4	24%	
Hempstead, Nassau – 11559	2	2	12%	
Hempstead, Nassau – 11783	0	2	12%	
Total Nassau & Suffolk Counties	2	17	100%	2%
Westchester County				
Croton-on-Hudson, Cortlandt, Yorktown - 10520	3	3	17%	
Mount Vernon - 10550	2	2	11%	
Mount Vernon - 10553	11	11	61%	
Yonkers, Greenburgh - 10710	2	2	11%	
Total Westchester County	18	18	100%	2%
Total Outside New York City	68	153	18%	18%
Total Trucks	365	823		

Attachment 1

BIC Directive and Fax-Back Tonnage Form

BUSINESS INTEGRITY COMMISSION
100 Church Street · 20th Floor
New York · New York 10007
Tel. (212) 676-6219 · Fax (212) 676-6204

October 9, 2003

COMMISSION DIRECTIVE

TO ALL LICENSED TRADE WASTE CARTERS AND THOSE OPERATING WITH TEMPORARY PERMISSION OR IN GRANDFATHERED STATUS

This directive is accompanied by a two-page survey form. You are required to complete both pages, which call for you to supply information on the amount of refuse and recyclables your company tipped in the first six (6) months of 2003, and to list the transfer stations at which you tipped refuse and/or recyclables during the same timeframe.

This form must be completed and returned by fax no later than October 17, 2003. It is to be faxed to 212-788-4019 or 212-788-3949.

If you have any questions regarding the content of the survey form, how to complete it or any other aspect of this order, call **Linda Urbanski of the NYC Sanitation Department, at tel.** 646-885-4809.

A data collection team may conduct an in-person, follow-up interview. If you are going to be interviewed, you will receive a telephone call to schedule the interview. Your company must make a senior manager available for the follow-up interview.

This survey is being conducted as part of New York City's commercial waste study, about which the commission has previously informed you. The data you are supplying is a vital part of the study and will be used in formulating the city's comprehensive solid waste management plan.

Failure to return the completed survey form, failure to supply all of the required information or failure to cooperate with the follow-up interview will be considered a violation of commission rules, 17 RCNY, section 1-09, and will subject you to a fine.

José Maldonado
Chairman

CWS2-1

New York City Comprehensive Commercial Waste Management Study Phase II
Summary Sheet

Carter's Name & Address: _____

Preparer/Contact Person: _____

Phone Number/Fax Number _____

Summary of Transfer Stations:

January 1-June 30, 2003	Number of Stations		Total Refuse Collected		Total Recycling Collected		(A) Grand Total
				+		=	

Destinations:
Enter totals from the detail sheet prepared for each transfer station to which you delivered garbage or recyclables.

Name of Transfer Station	Garbage Quantity Tons	Recycling Quantity Tons
GRAND TOTALS		

Fax completed sheets to NYC DOS per instructions in cover letter.

New York City Comprehensive
Commercial Waste Management Study Phase II

CWS2-2

Detail Sheet

Fill in one sheet for each location at which you delivered garbage and recyclables from January 1 through June 30, 2003

Company Name: _____ Preparer/Contact Person: _____

Company Address: _____

Phone Number _____ Fax Number: _____

Transfer Station: Name _____
Address _____
Borough (if in NYC) _____
State _____

FILL OUT A SEPARATE SHEET FOR EACH LOCATION WHERE YOU DELIVERED GARBAGE OR RECYCLABLES

Year 2003 Month:	Garbage Quantity Tons
January	
February	
March	
April	
May	
June	
GARBAGE TOTALS	

Year 2003 Month	Specify type of material (eg. Cardboard)	Recyclables Quantity Tons
January		
February		
March		
April		
May		
June		
RECYCLABLE TOTALS		

Attachment 2

Survey Form for On-Site or Telephone Hauler Interviews

NEW YORK CITY COLLECTOR DATA

Name of Firm _____
Street Address _____
Borough or City, State _____
Phone _____-_____-_____
Fax _____-_____-_____
Cell _____-_____-_____
e-mail _____
Business Integrity # _____
Name/title of Contact _____
Interview completed by: _____
Date: _____

I. TRADE WASTE ONLY

Trucks	Rear Load	Rear Load	Front Load	Roll Off	Other _____	Other _____	Other _____	Total
# owned								
# leased								
% Deployed at night								
% Deployed during day								
Cubic yard capacity								
Truck shifts/week:*								
Manhattan								
Brooklyn								
Bronx								
Queens								
Staten Island								
TOTAL								
# of loads (pulls)/truck shift								
Manhattan								
Brooklyn								
Bronx								
Queens								
Staten Island								
Average miles/truck shift								
Average weight/load								
Jan-June MSW tons 2003								
* A truck shift = a truck and crew deployed for a day or night's work								

II. NEW YORK CITY RECYCLING COLLECTION – PAGE 2

COMMODITY	TRUCKS USED			WEEKLY TRUCK SHIFTS BY BOROUGH					TONS/ LOAD	LOADS/ TS**	TOTAL JAN-JUNE 2003 TONS
	TYPE*/ YDS^3	% DEPLOYED AT NIGHT /DAY	MILES/ TRUCK SHIFT	MANHATTAN	BROOKLYN	BRONX	QUEENS	STATEN ISLAND			
OFFICE PAPER		/									
NEWSPRINT		/									
CORRUGATED		/									
MIXED PAPER		/									
OTHER PAPER____		/									
WOOD PALLETS		/									
GLASS		/									
METAL CANS (NON AL)		/									
ALUMINUM CANS		/									
PLASTIC #_____		/									
OTHER _____		/									
Other _____		/									
Other _____		/									
Other _____		/									

*** TYPE – INDICATE LOADING LOCATION & TYPE (E.G. RL PACKER; OPEN TOP (OT) ROLL OFF; STAKE BODY, ETC.)**
****TS= TRUCK SHIFT**

1. Where are vehicles parked? Zip code: ___ ___ ___ ___ ___ Borough or City: _____
2. Are they parked indoors? (1=yes; 0=no) ☐
3. Totals for first half 2003:# of Customers Miles Driven

Manhattan	_____	_____	Queens	_____	_____
Brooklyn	_____	_____	Staten Island	_____	_____
Bronx	_____	_____			

NEW YORK CITY COLLECTOR DATA – PAGE 3

II. TRUCK SHIFT WORK SHEETS

A. GARBAGE TRUCK SHIFT WORK SHEET

Truck Type & Cubic Yard Capacity	Borough	Truck shifts per day							
		Sun.	Mon.	Tues.	Wed	Thurs.	Fri.	Sat.	Total
1. Rear load ___yds	Manhattan								
	Brooklyn								
	Queens								
	Bronx								
	Staten Island								
	Total								
2. _____ ___yds	Manhattan								
	Brooklyn								
	Queens								
	Bronx								
	Staten Island								
	Total								
3. _____ ___yds	Manhattan								
	Brooklyn								
	Queens								
	Bronx								
	Staten Island								
	Total								
4. _____ __yds	Manhattan								
	Brooklyn								
	Queens								
	Bronx								
	Staten Island								
	Total								

NEW YORK CITY COLLECTOR DATA – PAGE 4

B. RECYCLING TRUCK SHIFT WORK SHEET

Truck Type & Cubic Yard Capacity	Borough	Truck shifts per day							
		Sun.	Mon.	Tues.	Wed	Thurs.	Fri.	Sat.	Total
1. Rear load ___yds	Manhattan								
	Brooklyn								
	Queens								
	Bronx								
	Staten Island								
	Total								
2. _____ ___yds	Manhattan								
	Brooklyn								
	Queens								
	Bronx								
	Staten Island								
	Total								
3. _____ ___yds	Manhattan								
	Brooklyn								
	Queens								
	Bronx								
	Staten Island								
	Total								
4. _____ ___yds	Manhattan								
	Brooklyn								
	Queens								
	Bronx								
	Staten Island								
	Total								

NEW YORK CITY COLLECTOR DATA – PAGE 5

CONSISTENCY CHECK QUESTIONS

Note questions and resolution of any inconsistencies in analyzing the faxed CWS2 forms and the BIC summary form:

_____

_____

_____

_____

_____

_____

_____

_____

COMMENTS AND SUGGESTIONS

What would you like to see done differently in New York City regarding waste collection and disposal?

_____

_____

_____

_____

_____

_____

_____

_____

Attachment 3

Expanded Tables of Recycling by Commodity

Table A.3-1
Commercial Putrescible Waste
Tons of Recycled Waste, 2003[1][2][3]
(Tons/Year)

Material	Manhattan	Brooklyn	Bronx	Queens	Staten Island	Total	Percent of Total Tons
Mixed Office Paper	267,344	99,070	28,873	46,472	992	442,751	51%
Old Corrugated Cardboard	80,934	59,943	45,032	115,557	19,963	321,429	37%
Sorted Office Paper	8,528	4,004	1,040	4,628	1,456	19,656	2%
Newspaper	4,498	3,432	650	3,432	0	12,012	1%
Textiles	4,164	3,885	105	3,885	46.6	12,085	1%
Wooden Pallets	16,707	5,633	2,398	5,594	1,066	31,397	4%
Organics	0	655	0	655	0	1,310	<1%
Bakery Waste	0	2,808	0	0	0	2,808	<1%
Bottles and Cans	14,709	6,719	2,879	6,719	1,280	32,306	4%
Plastic Bags	156	156	0	0	0	312	<1%
Metal	104	0	0	0	0	104	<1%
Total	397,144	186,305	80,976	186,942	24,803	876,170	100%
Percent of Total Tons	45%	21%	9%	21%	4%	100%	

Notes:
(1) Tons are rounded to the nearest whole number.
(2) Total tons include estimates from the carter survey, plus materials recycled from Transfer Stations from mixed loads, plus estimated deposit containers.
(3) Numbers may not add due to rounding.

Table A.3-2
Materials Recycled from Transfer Stations from Mixed Loads, 2003

Material	Non-Putrescible Transfer Stations	Putrescible Transfer Stations	Total Tons	Tons/day
Wood chips[1]	26,057	582	26,639	85
Old Corrugated Cardboard	4,481	348	4,829	15
Mixed Office Paper	931	479	1,410	5
Plastic bottles, jugs	994	0	994	3
Textiles	1,165	0	1,165	4
Totals	33,627	1,409	35,037	112

Notes:
(1) 50% of wood chips is assumed to come from commercial sector.
(2) Numbers may not add due to rounding.

Attachment 4

Discussion of Commercial Recycling through the Deposit System

Table A.4-1
Estimated Beverage Containers Recycled from the Commercial Sector through the Deposit System, 2003

	Glass (tons)	Plastic (tons)	Aluminum (tons)	Total (tons)[(1)]
Beer and Wine Products	28,000		450	28,450
Soda		1,400	1,150	2,550
Total	28,000	1,400	1,600	31,000

Note:
(1) Numbers may not add due to rounding.

The deposit container estimate was developed from a survey of recycling facilities and an analysis of beverage consumption market data combined with New York State Department of Environmental Conservation (NYSDEC) deposit initiation and redemption data for Region 2. Since the NYSDEC tracks deposits initiated or redeemed by dollars, the market consumption data is necessary to determine point of consumption (residential or commercial) and the material and size of the containers. The types of the various containers, by material and size, will impact the tons generated and recovered. The most recent data available were used in this analysis.

An estimated 28,000 tons of deposit glass containers were recovered through recycling facilities in 2002 (see Volume II, Appendix A). This same quantity was assumed for 2003. Although most of the deposit glass containers are from beer products, some wine products are also included. An analysis of beer consumption market data[1] would suggest an 85% commercial recycling rate of glass deposit containers in the City. NYSDEC deposit redemption data estimates a combined residential and commercial return rate of 72% for beer containers in 2001.[2] This suggests that the commercial sector recovers glass beer bottles at a higher rate than the residential sector.

The quantity of aluminum beer container generation was first estimated from The Beer Institute market consumption data, by gallons, for New York State adjusted to the City by population. On-premise sales of beer in aluminum packaging were estimated from national data.[3] The number of containers estimated from the marketing consumption data was then adjusted to match the NYSDEC deposit initiation data. Although the initiation of a deposit in the City, as tracked by NYSDEC, doesn't guarantee consumption within the City, the NYSDEC data is the best available information.[4] The adjusted number of containers was converted to tons with the factor 33.8 cans per pound.[5] The generation estimate was then combined with the NYSDEC average

---

[1] The Beer Institute data by gallons consumed and packaging mix for New York State 2000 adjusted to 2001 from U.S. consumption data (www.beerinstitute.org). The data year 2000 was the latest available at the state level. Commercial on-premise sales by volume estimated from Miller Brewing Company 2002 national data (Chapters 1 and 2 www.sabmiller.com/beer%20is%20volume%20with%20profit.).

[2] NYSDEC. Beverage Container Deposit and Redemption Statistics, October 1, 2000 – September 30, 2001.

[3] Commercial on-premise sales by volume and packaging estimated from Miller Brewing Company 2002 national data (Chapters 1 and 2 www.sabmiller.com/beer%20is%20volume%20with%20profit.).

[4] The market consumption data estimate was 6% lower than the NYSDEC deposit initiation data.

[5] The Aluminum Association, 2004, www.aluminum.org.

redemption rate of 72% to estimate commercial aluminum beer container recycling in the City. The NYSDEC 2001 Region 2 redemption rate which combines both residential and commercial redemption was assumed for 2003. This analysis estimated 450 tons of aluminum beer containers were recycled from the City's commercial sector through the deposit system.

Similar to aluminum beer containers, aluminum and plastic deposit soda containers were estimated from a combination of market consumption data,[6] packaging data,[7] and NYSDEC deposit data. The Northeast regional market consumption data combined with the packaging data predicted a number of deposit containers in the City greater than the NYSDEC statistics. The City estimate, based on regional consumption, was reduced approximately 50% to match NYSDEC deposit initiation data. A call to a soft drink industry representative verified that the City does consume soft drinks at a level below the Northeast regional average. The specific level of consumption is not available to the public. The estimated generation of containers developed from the market consumption data and NYSDEC deposit initiation data was then combined with NYSDEC deposit redemption data. The NYSDEC estimated that soda containers were redeemed at a 49% rate in 2001. This rate was assumed for 2003. This analysis estimated 1,400 tons of plastic soda containers and 1,150 tons of aluminum soda containers were recycled from the commercial sector through the deposit system.

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[6] Beverage World, Regional soft drink consumption, May 2002. Gallons consumed per person per year.
[7] Datamonitor, United States - Soft Drinks Industry Profile, October 2002, www.datamonitor.com.

APPENDIX D

COMMERCIAL PUTRESCIBLE WASTE 20-YEAR FORECAST

TABLE OF CONTENTS

ATTACHMENTS

LIST OF TABLES

1.0 COMMERCIAL PUTRESCIBLE WASTE PROJECTIONS

This section of the Commercial Waste Management Study (Study) includes projections of commercial putrescible waste through the year 2024. The purpose of the commercial putrescible waste forecasts is to provide New York City (City) with an estimation of the quantity of waste that will have to be transferred and disposed over a 20-year planning period, as mandated by the Comprehensive Solid Waste Management Plan (New SWMP).

These projections are based on the following assumptions:

- Waste generation, on an average tons per employee basis, remains at 2003 levels for each borough;
- Waste generation, on an average tons per employee basis, remains constant across the community districts (CDs) within each borough; and
- The percentage recycling of waste generation, by borough, remains at 2003 levels.

By maintaining waste generation and recycling rates at 2003 levels, the projections in this section increase by the projected change in employment. Since world markets impact recycling, the more conservative approach of holding recycling rates at 2003 levels was chosen. No one can foresee with accuracy changes in the economy (e.g., booms and recessions), which affect the amounts of waste generation. In addition, it is difficult to predict how innovations and new products will affect the amounts. However, in spite of inherent limitations, for planning purposes it is still useful to look at projections.

These projections of the putrescible fraction of the City's commercial waste are based upon:

- Quarterly in-City putrescible Transfer Station reports for 2003 (City Department of Sanitation [DSNY] Quarterly Transfer Station Reports, or Quarterly Reports);
- The estimate of commercial putrescible waste recycling quantities developed from the Business Integrity Commission (BIC) and DSNY 2003 survey data, plus estimated recycling at City Transfer Stations, plus estimated recycling through the deposit container redemption system; and
- Current and projected employment statistics.

1.1 2003 Baseline Estimate of Commercial Putrescible Waste

An employment-based generation model was used, for comparison purposes, to estimate 2003 commercial putrescible waste quantities. Current employment statistics (2003) were entered into the model and the model results were then compared to the generation estimate developed from the BIC-DSNY carter survey conducted in 2003 and reported in this Study in Volume II, Appendix C. The employment-based generation model estimate is approximately 12% higher than the 2003 BIC-DSNY carter survey results.

The employment-based generation model results were also compared to the generation estimate developed from the Quarterly Reports plus the recycling estimates. The Quarterly Reports disposal estimate was based on the first three quarters of 2003; the data were annualized. The employment-based generation model estimate is approximately 10% higher than the Quarterly Reports plus the recycling estimate.

It was determined that the 2003 Quarterly Reports plus the recycling estimate provided a baseline estimate that was more realistic than the employment-based model. Therefore, the 2003 Quarterly Reports plus the commercial recycling estimate was chosen as the baseline for the New SWMP Planning Period forecast estimates.

For the projection estimates, the 2003 generation estimate developed from the Quarterly Reports plus the commercial recycling estimate was used to create factors that were then applied to City employment forecast data. Employment was chosen as the forecast indicator because job growth (or loss) will directly affect waste generation. Additionally, since employment forecast data are readily available, the waste quantity projections can be adjusted when the City employment forecast data are updated. The factors remained constant through the time series. The forecast estimates are in four- or five-year intervals through 2024.

1.2 Development of City Employment Forecast Data

Employment data were developed by Parsons Brinckerhoff using data from the New York Metropolitan Transportation Council (NYMTC). (See Volume II, Appendix B, Attachment 1.) NYMTC prepared employment projections for the City through the year 2025 early in 2001, basing their projections on the most current employment data available at that time. The categories of employment included total employment, total basic and total non-basic industries, and several "land use" categories (e.g., retail employment, office employment, etc.), which were pertinent to NYMTC tasks. The resultant NYMTC projections were prepared at county and census tract levels.

The 2000 NYMTC projections of employment were revised by NYMTC over the course of 2002 and 2003 to account for the effects of September 11 and superceded in July 2003 when an interim update of the projections was published by NYMTC in a supplement titled, "Demographic and Socioeconomic Forecasting Post September 11 Impacts, Technical Memoranda 3.1 and 3.2." This reported and accounted for the direct effects of September 11 -- both direct job loss in the City and geographic redistribution of employment within the City. These interim projections remained in the same format as the earlier projections (i.e., by counties and census tracts and using similar employment categories).

New projections from base years more recent than 2000 are under preparation by NYMTC at the time of this Study; however, at the time of this report, results were not available. Therefore, the interim projections have been utilized as the fundamental employment projection data on which the City Department of Sanitation (DSNY) waste estimation model relies.

Additional modifications to these interim projections, however, have been made in order to reflect baseline (2002) conditions at the CD level. First, the projections, which were available at the census tract level, have been translated into CDs according to City Department of City Planning (NYCDCP) guidance. Second, the job loss resulting from the effects of economic recession in the City, which was not reflected in the NYMTC interim projections, has also been incorporated into the projections on which the projections herein rely.

The NYMTC projections, which have been developed by its various associated agencies, account for such factors as regional trends in the metro area. They have also been made readily available to DSNY and are in public use. The interim projections, which also account for in-City redistribution of jobs since September 11, are the only such projections to 2025 available at the census tract level. These interim projections are necessary to generate employment projections for the New SWMP Planning Period. Therefore, in an effort to maximize the use of existing data, DSNY adjusted these projections only as necessary and possible to better reflect existing employment conditions, according to currently available employment data. Since the projections were prepared in five-year intervals from 2005 to 2025, a straight-line projection was assumed to derive projections for the year 2024.

The interim projections, once translated into CD-level geographies, were further adjusted to:

- Reflect 2000-2003 employment loss attributable to economic recession; and
- Maintain as accurately as possible the distribution of employment by industry sector.

Table 1.2-1 shows the employment forecast data, by borough, for 2003 through 2024.

1.3 Distribution of Commercial Putrescible Waste Generation to the Borough Level

The 2003 carter survey conducted by BIC-DSNY tabulated the origin of the commercial putrescible waste, by borough, as well as the quantities generated. These percentages were applied to the 2003 citywide waste generation total to estimate borough commercial putrescible waste generation. The origin of commercial putrescible waste by borough shown in this section reflects the percentages estimated through the survey.

The total quantity of waste generated in each borough in 2003 was divided by the total number of employees in each borough in 2003. These borough-specific average waste generation factors remained constant through 2024. The factors, on a tons per employee per year basis, are:

- Bronx 1.951;
- Brooklyn 1.381;
- Manhattan 0.677;
- Queens 1.312; and
- Staten Island 1.780.

Table 1.2-1
New York City Employment Forecast by Borough, 2003 through 2024

Borough	2003	2005	2010	2015	2020	2024
Bronx	203,965	204,865	211,763	217,157	227,169	234,905
Brooklyn	433,236	435,556	442,393	448,092	457,946	463,513
Manhattan	1,929,010	2,000,769	2,038,921	2,077,099	2,111,357	2,136,387
Queens	474,963	478,011	488,959	497,629	513,198	523,274
Staten Island	89,742	90,579	94,610	97,363	100,796	102,676
Total[(1)]	**3,130,916**	**3,209,780**	**3,276,646**	**3,337,340**	**3,410,466**	**3,460,755**

Note:
(1) Employment forecast data exclude education employees and local government employees.

The waste generation factors developed at the borough level were also assumed at the CD level. Tables showing commercial putrescible waste generation, at the CD level, are included as an attachment to this appendix. However, these estimates should be used with caution. The borough average generation factor may not be a good indicator for every CD within that borough, as one single large employer can greatly impact the average.

1.4 Commercial Putrescible Waste Recycled and Disposed Estimates

The commercial putrescible waste generation is that quantity of waste generated prior to any recycling efforts.[1] The 2003 BIC-DSNY survey of commercial collection firms, the estimated recycling at City Transfer Stations and estimated recycling through the deposit container redemption system were the sources for the recycled quantity estimates (for detail see Volume II, Summary Report, Table 3.2-1). The estimated recycling rates were developed from the 2003 data, which documented the quantity of materials recovered for recycling. To calculate the recycling rate, the quantity of recycled material was divided into the sum of recycled material plus waste disposed as determined from the 2003 Quarterly Reports. The data allowed for this calculation at the borough level. The recycling rates, by borough, are assumed to remain constant through 2024. For example, Manhattan recycled approximately 29% of the commercial putrescible waste that they generated in 2003 (71% was disposed); this rate (29%) was assumed through 2024 for Manhattan. The recycling percentages then were applied to the forecasted waste generation to obtain tonnage estimates for each four- or five-year interval.

The disposal estimates equal commercial putrescible waste generation minus commercial putrescible recycling for each borough.

1.5 Development of Final Database and Results

The final database for the commercial putrescible waste projections combined the generation factors developed from 2003 data collected by the in-City putrescible Transfer Stations in the Quarterly Reports plus the recycling estimate, the employment forecasts by borough and CD, waste origin (from the BIC-DSNY survey) and estimated recycling rates developed from the 2003 recycling data.

[1] Generation equals recycling plus disposal.

Table 1.5-1 shows citywide generation, recycling and disposal estimates for 2003 and 2005 through 2024 at four- or five-year intervals. Waste origin, by borough, is included in Table 1.5-2. Commercial putrescible waste generation by borough is shown in Table 1.5-3. The estimated recycling rate for each borough is shown in Table 1.5-4, and commercial putrescible waste recycling and disposal estimates, by borough, are shown in Tables 1.5-5 and 1.5-6.

Table 1.5-1
New York City Estimated Commercial Putrescible Waste Generation, Recycling and Disposal, 2003 through 2024

New York City	2003 (tons)	2005 (tons)	2010 (tons)	2015 (tons)	2020 (tons)	2024 (tons)
Generation	3,086,000	3,145,000	3,214,000	3,275,000	3,358,000	3,414,000
Recycling	824,000	840,000	858,000	874,000	895,000	909,000
Disposal	2,262,000	2,305,000	2,356,000	2,401,000	2,463,000	2,505,000

Table 1.5-2
Origin of Commercial Putrescible Waste Generation by Borough, 2003[(1)(2)]

	Percent of Generation
Bronx	12.9%
Brooklyn	19.4%
Manhattan	42.3%
Queens	20.2%
Staten Island	5.2%
New York City	100%

Notes:
(1) Numbers may not add due to rounding.
(2) Source: Commercial Waste Management Study, Volume II, Appendix C.

Table 1.5-3
Generation of Commercial Putrescible Waste by Borough, 2003 through 2024[(1)(2)(3)]

	2003 (tons)	2005 (tons)	2010 (tons)	2015 (tons)	2020 (tons)	2024 (tons)
Bronx	398,000	400,000	413,000	424,000	443,000	458,000
Brooklyn	599,000	602,000	611,000	619,000	633,000	640,000
Manhattan	1,306,000	1,355,000	1,380,000	1,406,000	1,429,000	1,446,000
Queens	623,000	627,000	642,000	653,000	673,000	687,000
Staten Island	160,000	161,000	168,000	173,000	180,000	183,000
Total (tons/yr)	**3,086,000**	**3,145,000**	**3,214,000**	**3,275,000**	**3,358,000**	**3,414,000**

Notes:
(1) 2003 numbers derived by multiplying generation quantities (Table 1.5-1) by borough of origin (Table 1.5-2). 2005 through 2024 numbers derived from employment generation factors.
(2) Numbers may not add due to rounding.
(3) Numbers for 2003 are preliminary, and not based upon a full year's worth of data. These numbers will be updated when data are available.

Table 1.5-4
Estimated Commercial Putrescible Waste Recycling Rate by Borough[(1)]

	Percent of Generation
Bronx	19.3
Brooklyn	29.2
Manhattan	28.6
Queens	28.3
Staten Island	14.4
New York City	26.7

Notes:
(1) Source: Percentages calculated from 2003 BIC-DSNY carter survey data or recycling at City Transfer Stations plus estimated recycling through the deposit container redemption system. It should be noted that these percentages are based upon preliminary data for 2003, and will be updated as more information becomes available.

Table 1.5-5
Recycling of Commercial Putrescible Waste by Borough, 2003 through 2024[(1)(2)]

	2003 (tons)	2005 (tons)	2010 (tons)	2015 (tons)	2020 (tons)	2024 (tons)
Bronx	77,000	77,000	80,000	82,000	86,000	89,000
Brooklyn	175,000	176,000	179,000	181,000	185,000	187,000
Manhattan	373,000	387,000	394,000	402,000	408,000	413,000
Queens	176,000	177,000	181,000	184,000	190,000	194,000
Staten Island	23,000	23,000	24,000	25,000	26,000	26,000
Total (tons/yr)	**824,000**	**840,000**	**858,000**	**874,000**	**895,000**	**909,000**

Notes:
(1) Derived by multiplying generation quantities (Table 1.5-3) by borough estimated recycling rate (Table 1.5-4).
(2) Numbers may not add due to rounding.

Table 1.5-6
Disposal of Commercial Putrescible Waste by Borough, 2003 through 2024[(1)(2)]

	2003 (tons)	2005 (tons)	2010 (tons)	2015 (tons)	2020 (tons)	2024 (tons)
Bronx	321,000	323,000	333,000	342,000	357,000	369,000
Brooklyn	424,000	426,000	432,000	438,000	448,000	453,000
Manhattan	933,000	968,000	986,000	1,004,000	1,021,000	1,033,000
Queens	447,000	450,000	461,000	469,000	483,000	493,000
Staten Island	137,000	138,000	144,000	148,000	154,000	157,000
Total (tons/yr)	**2,262,000**	**2,305,000**	**2,356,000**	**2,401,000**	**2,463,000**	**2,505,000**

Notes:
(1) Derived by subtracting recycling quantities (Table 1.5-5) from generation quantities (Table 1.5-3).
(2) Numbers may not add due to rounding.

Attachment 1

Estimated Commercial Putrescible Waste Generation, 2003 through 2024, by Borough

Bronx
Estimated Commercial Putrescible Waste Generation, 2003 through 2024

Community District	2003 (tons)	2005 (tons)	2010 (tons)	2015 (tons)	2020 (tons)	2024 (tons)
1	41,200	41,300	42,800	43,900	46,000	47,600
2	30,800	31,700	32,500	33,200	34,400	35,300
3	18,200	18,200	18,800	19,300	20,200	20,900
4	37,300	37,400	38,800	39,900	42,000	43,700
5	19,300	19,400	20,200	21,000	21,900	22,800
6	25,500	25,500	26,300	26,900	28,000	28,900
7	48,600	48,700	50,500	51,800	54,300	56,200
8	29,500	29,600	30,800	31,700	33,300	34,600
9	32,000	32,000	33,300	34,200	36,000	37,300
10	31,800	31,900	32,900	33,600	35,100	36,200
11	46,400	46,500	47,800	48,800	50,700	52,200
12	37,400	37,500	38,700	39,600	41,300	42,600
Total[(1)]	**398,000**	**399,700**	**413,400**	**423,900**	**443,200**	**458,300**

Notes:
(1) Numbers may not add due to rounding.

Brooklyn
Estimated Commercial Putrescible Waste Generation, 2003 through 2024

Community District	2003 (tons)	2005 (tons)	2010 (tons)	2015 (tons)	2020 (tons)	2024 (tons)
1	56,500	56,800	57,700	58,400	59,700	60,400
2	105,100	105,700	107,400	108,800	111,100	112,500
3	25,200	25,300	25,700	26,000	26,600	26,900
4	17,400	17,500	17,800	18,000	18,400	18,600
5	31,300	31,400	31,900	32,300	33,100	33,500
6	37,200	37,400	38,000	38,500	39,300	39,800
7	35,700	35,900	36,400	36,900	37,700	38,200
8	14,700	14,800	15,100	15,300	15,600	15,800
9	16,400	16,500	16,800	17,000	17,400	17,600
10	30,700	30,900	31,300	31,700	32,400	32,800
11	29,400	29,500	30,000	30,400	31,000	31,400
12	46,700	47,000	47,700	48,300	49,400	50,000
13	18,100	18,200	18,500	18,700	19,100	19,300
14	31,800	31,900	32,400	32,900	33,600	34,000
15	34,200	34,400	35,000	35,400	36,200	36,600
16	11,600	11,600	11,800	12,000	12,200	12,400
17	24,500	24,700	25,100	25,400	25,900	26,300
18	32,100	32,300	32,800	33,200	33,900	34,300
Total[(1)]	**598,600**	**601,800**	**611,400**	**619,200**	**632,600**	**640,400**

Notes:
(1) Numbers may not add due to rounding.

Manhattan
Estimated Commercial Putrescible Waste Generation, 2003 through 2024

Community District	2003 (tons)	2005 (tons)	2010 (tons)	2015 (tons)	2020 (tons)	2024 (tons)
1	198,800	204,100	206,900	209,800	212,300	214,200
2	86,500	87,200	87,600	88,000	88,300	88,500
3	27,400	27,700	27,900	28,000	28,200	28,300
4	99,900	122,300	134,100	146,000	156,600	164,400
5	533,500	545,900	552,500	559,100	565,000	569,400
6	155,400	159,300	161,400	163,500	165,400	166,800
7	45,900	47,000	47,600	48,300	48,800	49,200
8	89,700	90,500	90,900	91,400	91,700	92,000
9	22,000	22,000	22,000	22,000	22,000	22,000
10	8,600	9,100	9,300	9,500	9,800	9,900
11	21,200	22,400	23,000	23,600	24,100	24,500
12	15,200	15,200	15,200	15,200	15,200	15,300
Central Park	1,800	1,800	1,800	1,800	1,800	1,800
Total[(1)]	**1,305,900**	**1,354,500**	**1,380,200**	**1,406,200**	**1,429,200**	**1,446,300**

Notes:
(1) Numbers may not add due to rounding.

Queens
Estimated Commercial Putrescible Waste Generation, 2003 through 2024

Community District	2003 (tons)	2005 (tons)	2010 (tons)	2015 (tons)	2020 (tons)	2024 (tons)
1	66,000	66,400	68,000	69,300	71,600	73,100
2	67,400	67,800	69,300	70,600	72,700	74,200
3	53,300	53,600	54,800	55,800	57,500	58,600
4	33,700	33,900	34,700	35,300	36,400	37,100
5	54,400	54,800	56,000	57,000	58,800	59,900
6	86,300	86,800	88,800	90,400	93,200	95,000
7	69,400	69,800	71,400	72,600	74,900	76,400
8	34,300	34,500	35,300	35,900	37,100	37,800
9	20,200	20,400	20,800	21,200	21,800	22,300
10	13,800	13,900	14,200	14,500	14,900	15,200
11	26,800	27,000	27,600	28,100	29,000	29,500
12	62,900	63,300	64,700	65,900	67,900	69,200
13	23,000	23,100	24,000	24,100	24,800	25,300
14	11,700	11,800	12,000	12,300	12,600	12,900
Total[(1)]	**623,200**	**627,100**	**641,600**	**653,000**	**673,200**	**686,500**

Notes:
(1) Numbers may not add due to rounding.

Staten Island
Estimated Commercial Putrescible Waste Generation, 2003 through 2024

Community District	2003 (tons)	2005 (tons)	2010 (tons)	2015 (tons)	2020 (tons)	2024 (tons)
1	86,100	86,900	90,700	93,400	96,700	98,500
2	49,500	50,000	52,200	53,700	55,600	56,600
3	24,200	24,400	25,500	26,200	27,200	27,700
Total[(1)]	**159,800**	**161,300**	**168,400**	**173,300**	**179,500**	**182,800**

Notes:
(1) Numbers may not add due to rounding.

APPENDIX E

NON-PUTRESCIBLE COMMERCIAL WASTE QUANTIFICATION AND PROJECTIONS

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1.0 ESTIMATED QUANTITIES OF CONSTRUCTION AND DEMOLITION DEBRIS AND CLEAN FILL

1.1 Introduction

This report estimates and projects through 2024 the quantities of non-putrescible waste and clean fill generated in New York City (City). Together, these two waste stream components are generally referred to as construction and demolition (C&D) debris. The City defines non-putrescible waste[1] and clean fill[2] according to the type of materials being discarded. Both waste streams consist of inert materials and both might include materials from building construction, demolition or renovation or materials resulting from non-building construction such as road or bridge work. Clean fill loads mostly consist of single materials such as dirt, concrete, asphalt millings or gravel. Non-putrescible waste tends to include these same materials, but generally in loads with multiple materials. Non-putrescible waste also includes many building-related materials, such as sheetrock, plaster, electrical cables, piping, window frames, etc.

Most communities in the United States do not separate C&D debris into the categories used by the City. Rather, C&D debris is broken down into two major categories: 1) building-related debris generated from building construction, demolition and renovation; and 2) non-building debris generated from activities such as road construction, sewer installation and bridge renovation or construction. In order to project C&D quantities for the City, predictive data series were obtained from F.W. Dodge, enabling predictions of building- and non-building-related C&D debris. As these are the only predictive data series available, the City Department of Sanitation's (DSNY) Consultant developed estimates of the sum of non-putrescible and clean fill for the City. Clean fill is projected by utilizing its historic percentage and applying that percentage to the sum of building-related and non-building-related C&D.

[1] Non-putrescible solid waste, as defined in DSNY regulations (Subchapter A of 4 RCNY 16), is solid waste, whether or not contained in receptacles, that does not contain organic matter having the tendency to decompose with the formation of malodorous by-products, including but not limited to dirt, earth, plaster, concrete, rock, rubble, slag, ashes, waste timber, lumber, Plexiglas, fiberglass, ceramic tiles, asphalt, sheetrock, tar paper, tree stumps, wood, window frames, metal, steel, glass, plastic pipes and tubes, rubber hoses and tubes, electric wires and cables, paper and cardboard.

[2] Fill material, as defined in DSNY regulations, is only clean material consisting of earth, ashes, dirt, concrete, rock, gravel, asphalt millings, stone or sand, provided that such material shall not contain organic matter having the tendency to decompose with the formation of malodorous by-products.

1.2 Report Organization

This report is organized as follows. First, aggregate current quantities of C&D debris are determined, as reported in the DSNY's non-putrescible and fill material Quarterly Transfer Station Reports (Quarterly Reports). Next, future generation amounts are projected. To project C&D quantities into the future, however, it is necessary to relate the quantity of C&D to activities that result in the generation of this waste. The factors utilized are the projected amount of building activity and non-building construction and maintenance activity. Section 3.0 presents estimates of C&D in the City categorized as building-related and non-building-related, using data from F. W. Dodge regarding the level of such activities. These projections are used to derive an overall C&D estimate range, which in turn is separated into DSNY's categories using the relative proportions observed in recent years. The results are summarized and compared to those obtained in several other jurisdictions.

2.0 C&D DEBRIS IN NEW YORK CITY

2.1 Background

In 2000, there were 30 non-putrescible Transfer Stations (TSs) in the City. By early 2003, the number had been reduced to 28. These non-putrescible Transfer Stations typically receive C&D debris in roll-off containers. C&D debris consists of all the inert materials generated during building construction, demolition or remodeling. These materials include wood, metals, sheetrock, concrete, porcelain fixtures, appliances, carpeting, tiles, roofing materials, and, from non-building sources, asphalt, fill and large metals. Some Transfer Stations sort the materials to recover recyclables, such as metal, wood and aggregate. C&D debris, less quantities recycled, must be disposed of in landfills outside the City limits. After recycling and/or densification, the residuals of C&D processing are hauled out of the City in transfer trailers for disposal.

Most new construction in the City takes place on sites that require the demolition of existing buildings, while renovation is common in commercial and residential buildings when there is a change of tenancy. Typically, C&D debris is collected by a firm in the waste hauling (carter) or recycling business, hired as a subcontractor by the firm doing the construction, demolition or renovation work. C&D carters are licensed by the Business Integrity Commission (BIC). A small minority of the C&D debris is self-hauled by the firm or resident doing the work.

2.2 DSNY Quarterly Transfer Station Reports

The private non-putrescible Transfer Stations in the City are required to provide Quarterly Reports to the DSNY on the quantities of materials received, processed, recycled and disposed. As of early 2003, four (4) of these Transfer Stations did not use scales to weigh inbound loads; their reports list cubic yards received, which are converted to tons using density factors for various materials. Mixed C&D debris is converted to tons at a density of 1,500 pounds per cubic yard (lbs/cy).[3] Loads of recyclables are converted at a density of 500 lbs/cy. Most loads of a

[3] This is the density factor for C&D debris provided by the New York State Department of Environmental Conservation (NYSDEC).

single type of fill material (road building material, gravel, dirt, rocks, asphalt, and concrete) are converted at densities of approximately 2,200 lbs/cy. In 2000, approximately 49% of the materials received by non-putrescible Transfer Stations was weighed. By 2003, the figure rose to approximately 60%.

In early 2003, there were 20 fill material Transfer Stations licensed by the DSNY. None of these stations weighed incoming or outgoing debris. These materials are converted to tons either by the Transfer Station itself or by the DSNY, using the density factors for various materials referred to above.

Table 2.2-1 presents a summary of reported and estimated tons received by non-putrescible and fill material Transfer Stations for the first quarter of 2003. As indicated, there is a difference in the average weight of mixed C&D arriving at non-putrescible Transfer Stations and fill material Transfer Stations. In early 2003, approximately 60% of the non-putrescible Transfer Stations weighed incoming materials received just over 80% of aggregate non-putrescible materials. These stations provide DSNY with both cubic yards and tons of this material. When the density is actually computed for these weighed tons of mixed C&D debris, the density is 732 lbs/cy (calculated density). The DSNY uses 1,500 lbs/cy to estimate the weight of materials reported by non-putrescible Transfer Stations without scales. For the first quarter of 2003, estimated tons of mixed C&D debris are equal to 526,623 tons at the default density of 1,500 lbs/cy, and 443,927 tons at the calculated density of 732 lbs/cy. Assuming the unweighed tons approximate the provided density of 732 lbs/cy for the weighed tons, this results in an aggregate overestimate equal to 82,676 tons. It should be noted that these estimates are preliminary, as a full year's worth of data was not available at the time that this estimate was prepared, and are only utilized for comparative purposes.

Table 2.2-1
2003 DSNY C&D Debris
Utilizing Data for First Quarter of 2003

Input Material	Default Density (lbs/cy)	Tons by Type of Transfer Station		
		Non-Putrescible	Clean Fill	Total
Mixed C&D				
Weighed tons		351,085	78,789	429,874
calculated density (lbs/cy)		732	2,173	
Estimated tons	1,500			
@ calculated density		78,780	154,935	233,715
@ default density		161,456	224,422	385,878
Concrete	2,260	2,547	233,255	234,227
Road building material	2,320	991	76,833	77,824
Rock/Dirt/Fill	2,420	3,432	578,384	582,948
Gravel/Stone/Rocks	2,420	0	15,521	15,521
Bulk metal	500	963	0	1,281
Wood	500	4,717	0	6,274
Total tons				
@ calculated density		442,515	1,137,718	1,581,665
@ default density		526,191	1,207,205	1,733,828
Overestimate (Underestimate)		**82,676**	**(69,487)**	**13,189**
As a percent of total at calculated density		18.7%	-5.8%	0.8%

Notes:
lbs/cy = pounds per cubic yard

For fill material, the provided density is 2,173 lbs/cy for mixed C&D while the default density used by DSNY remains at 1,500 lbs/cy. Thus, fill is underestimated by 277,949 tons, which amounts to 5.8% of the total quantity of fill.

When aggregated, these overestimates and underestimates approximately cancel each other out. There is a less than 1% difference in the total tons computed using the provided density and the total tons computed using the default density. Some variation may be expected given the varying densities of the various components comprising C&D. As greater quantities of the heavier clean fill are delivered, DSNY may be underestimating the tonnage by utilizing the default density of 1,500 lbs/cy. The DSNY's aggregate C&D figures will be utilized as the baseline to project the total quantity of non-putrescible waste from the year 2003 through 2024.

2.3 Total Estimated Quantities of C&D Debris

Table 2.3-1 presents the daily average tonnages of fill and non-putrescible material by quarter, for the years 2000 through the first three quarters of 2003. As shown by this table, the amount of non-putrescible waste has increased by approximately 8.9% since the year 2000. Fill material, however, has increased dramatically over the same period of time, increasing by 70.1%. This same rate of growth cannot be expected to continue through the New SWMP Planning Period, and shows the high degree of variability in C&D generation from year to year. This variability makes it difficult to predict the future generation of C&D quantities and leads to the conclusion that a range of values may be more appropriate for predicting future C&D quantities.

Table 2.3-2 also presents the DSNY-reported quantities of clean fill and non-putrescible waste, which together equal the total quantity of C&D waste in the City, for the years 2000, 2001, 2002 and 2003, both on a tons per day and tons per year basis. C&D ranged from 6.35 million tons in 2000 to 7.91 million tons in 2002. For 2003, total tons are estimated at 8.64 million, by utilizing data from the first three quarters of 2003, and assuming that the 4th quarter would average 100% of the 3rd quarter for fill, and 90% of the 3rd quarter for C&D (as was the case in years 2000-2002). Average daily tonnage is in the 20,000 to 27,000 range, and it has increased steadily over these four years. It is not known if the trend will continue to rise, or if tonnages will, over time, revert to quantities more typical of the year 2000. The average of the three years for which complete data is available is just under 7 million tons. As also shown by the table, on average, clean fill represented approximately 60% of the total amount of C&D for the years 2000 through 2002, and non-putrescible C&D represented the remaining 40%. However, as shown by the 2003 data, clean fill appears to be accounting for an ever larger percentage of C&D debris, totaling almost 70%. Therefore, in allocating the total quantity of non-putrescible waste into C&D and clean fill constituents, a range will be shown with clean fill constituting between 60% and 70% of the total material, and C&D constituting between 30% and 40% of the total.

Table 2.3-1
DSNY Quarterly Reports
Year 2000-2003

DSNY Quarterly Reports Data - Fill Material				
Period	**2000 (tpd)**	**2001 (tpd)**	**2002 (tpd)**	**2003 (tpd)**
Quarter 1	8,847	9,192	12,347	14,801
Quarter 2	11,819	13,024	15,875	20,054
Quarter 3	11,687	12,258	19,186	20,718
Quarter 4	11,210	12,348	19,505	N/A
Average of all Quarters	10,891	11,706	16,728	18,524
% Change Year to Year		7.5%	42.9%	10.7%
% Change from Year 2000 to Year 2003				**70.1%**
DSNY Quarterly Reports Data - Non-Putrescible (C&D) Material				
Period	**2000 (tpd)**	**2001 (tpd)**	**2002 (tpd)**	**2003 (tpd)**
Quarter 1	8,022	9,438	8,065	7,020
Quarter 2	9,854	10,562	8,567	9,303
Quarter 3	10,726	10,078	9,222	9,580
Quarter 4	9,301	8,862	8,587	N/A
Average of all Quarters	9,475	9,735	8,610	8,634
% Change Year to Year		2.7%	11.6%	0.3%
% Change from Year 2000 to Year 2003				**-8.9%**

Table 2.3-2
Total Estimated Quantity of C&D in New York City

Item	Year			Average	2003[2]
	2000	2001	2002		
Tons per day input[1]					
Non-Putrescible C&D	9,475	9,735	8,610	9,274	8,626
Clean Fill C&D	10,891	11,706	16,729	13,109	19,069
Total C&D	20,366	21,441	25,340	22,382	27,695
Tons per year input					
Non-Putrescible C&D	2,956,200	3,037,398	2,686,398	2,893,332	2,691,390
Clean Fill C&D	3,398,070	3,652,194	5,219,526	4,089,930	5,949,450
Total C&D	6,354,270	6,689,592	7,905,924	6,983,262	8,640,840
Clean fill as percent of Total C&D	53.5%	54.6%	66.0%	58.6%	68.9%

Notes:
(1) Based upon 312 days per year of operation.
(2) 2003 consists of first three quarters, plus fourth quarter estimated at 90% of third quarter for non-putrescible and 100% of third quarter tonnages for fill material.

3.0 RESIDENTIAL CONSTRUCTION AND DEMOLITION DEBRIS ESTIMATES

This section provides estimates of the generation of C&D debris from residential construction, demolition and renovation. In order to approximate the difference in the characteristics of the City's housing stock in Staten Island compared to the other four boroughs, single-family C&D generation factors are used for Staten Island, and multi-family/commercial figures are used for the remaining boroughs.

3.1 Residential C&D Generation Factors

In order to estimate residential construction, demolition and renovation debris, one must first obtain waste generation factors specific to these activities in the residential sector. These waste generation factors were assembled, using a combination of sources obtained from the literature and surveys of construction firms and C&D haulers in the New York region. Next, the square footage of residential construction, demolition and renovation is projected through the year 2024. Finally, the appropriate residential waste generation factor is multiplied by the square footage to estimate C&D generation.

Table 3.1-1 presents the data used to derive waste generation factors. In summary, these averages used to estimate C&D from construction, demolition and renovation are:

- Residential construction debris at a rate of 4.10 pounds per square foot for single-family construction and 3.99 pounds per square foot for multi-family construction. This is combined into a weighted average of 4.02 pounds per square foot.
- Residential demolition debris at a rate of 85.10 pounds per square foot for single-family dwellings and 50.50 pounds per square foot for multi-family dwellings.
- Residential renovation at a weighted average rate of 27.30 pounds per square foot.

Table 3.1-1
Residential Construction, Demolition and Renovation Waste Generation Factors

Generation Factor (Pounds per Square Foot)	Comments	Source
4.00	National single-family	Jim Johnson, "OCC Means Volume at Sites," *Waste News*, March 31, 2003. Source: National Association of Home Builders Research Center.
5.47	Converted from 0.012 to 0.02 cubic yards/square foot @ 342 lbs/cubic yard. (See Table A-2)	*Illinois Construction and Demolition Site Recycling Guidebook,* Illinois Department of Commerce and Community Affairs. November 1997.
4.38	National single-family	Franklin Associates, Ltd. *Characterization of Building-Related Construction and Demolition Debris in the United States,* United States Environmental Protection Agency (USEPA), Office of Solid Waste, EPA530-R-98-010. June 1998.
2.96	Illinois sample. Average of range 1.92 –4.0 pounds per square foot.	*DuPage County Construction and Demolition Waste Survey and Education Program Report*, DuPage County Solid Waste Department and Illinois Department of Commerce and Community Affairs, November 1997.
3.35	1.5 pounds of wood /square foot, comprising 44.8% of residential construction debris.	Jim Johnson, "All Roads Lead to Landfill," *Waste News*, March 31, 2003. Source: National Association of Home Builders Research Center.
4.47	Average of 1.3 to 2.1 lbs. of wood /square foot, comprising 44.8% of residential construction debris.	Lynn Merrill, "Small Guys, Big Business," *Waste Age,* October 2000 Source: National Association of Home Builders Research Center.
4.10	National single-family. Average of 3.0 to 5.2 pounds per square foot.	*Residential Construction Waste Management: A Builder's Field Guide,* National Association of Home Builders Research Center.
4.10	**Average Single-Family Construction**	
3.99	**Average Multi-Family Construction (New York City)**	**Interviews with five construction companies in New York City.**
115.00	National single-family [(1)]	Franklin Associates, Ltd. *Characterization of Building-Related Construction and Demolition Debris in the United States,* USEPA, Office of Solid Waste, EPA530-R-98-010. June 1998.
55.20	Single-family demolition, 0.1 cubic yards per square foot, converted at 552 pounds per sq. ft.	Interview with Haggard Construction and WLNNS Demolition, Hopatcong, New Jersey.
85.10	**Average Single-Family Demolition**	
64.40	Multi-family public housing in Hartford, CT.	USEPA, *Building Savings: Strategies for Waste Reduction of Construction and Demolition Debris from Buildings, June 2000.*
36.56	Multi-family demolition, estimated at 0.0666 cubic yards per square foot, converted at 549 pounds per square foot.	Interview with URS Engineers, New York, New York (Chief Estimating Engineer).
50.50	**Average Multi-Family Demolition**	
9.0	Average of 7 to 11 pounds for whole house remodeling. 10% weighting.	*A Field Guide for Residential Remodelers,* National Association of HomeBuilders Research Center.
35.5	Average of 4 to 67 pounds per square foot, kitchen remodeling. 40% weighting.	*A Field Guide for Residential Remodelers,* National Association of HomeBuilders Research Center.
37.5	Average of 5 to 70 pounds per square foot, bathroom remodeling. 30% weighting.	*A Field Guide for Residential Remodelers,* National Association of HomeBuilders Research Center.
4.0	Average of 3 to 5 pounds per square foot, roof remodeling. 10% weighting.	*A Field Guide for Residential Remodelers,* National Association of HomeBuilders Research Center.
5.5	Average of 3 to 8 pounds per square foot, deck remodeling. 10% weighting.	*A Field Guide for Residential Remediless,* National Association of Homebuilders Research Center.
27.3	**New York City Residential Renovation Weighted Average**	

Note:

(1) This estimate includes concrete from basements, slabs, and driveways. Without these inclusions, the Franklin Associates figure for single-family is 49.5 pounds per square foot.

The waste generation factors for residential construction debris in Table 3.1-1 indicate that there is a general consensus on the waste generation rates per square foot of residential construction. Of the seven sources, four are in the 4.00 to 4.50 pounds per square foot range. The average waste generation is 4.10 pounds per square foot.

For multi-family construction waste generation, the average of information obtained during interviews with five City construction firms is used. This is derived based on the following average scenario: container use over the course of an average multi-family construction job averages one 30-cubic-yard container per week. This would apply to construction of a 25-story building with 375,000 square feet, occurring over 18 to 24 months, or in 21 months on average. Over the course of this 1.75-year period, 2,730 cubic yards of debris would be generated, which equates to 749 tons of debris, using a construction debris density of 549 lbs/cy. (See Attachment 1 and Table A-2.) This equates to a generation rate of 3.99 pounds per square foot. This is the generation factor used for multi-family construction.[4] Except for Staten Island, which has a high proportion of single-family housing, most of the City's residential construction is multi-family units. A weighted average generation factor of 4.02 pounds per square foot was applied to account for the relative weighting of projected square footage of single- and multi-family construction in the City.

3.2 Projections of Residential Construction, Demolition and Renovation Activity

Data on the annual square feet of residential construction in each of the City's five boroughs was obtained from F.W. Dodge. These data are actual figures through 2002, and estimates through 2007. A least squares regression was fitted to the available data and the resulting equation was used to estimate square feet of construction in the City through 2024. The square feet of residential construction within the City between 1997 and 2007 can be estimated using the following equation:

[4] As most of the United States is housed in single-family or low-rise multi-family structures, there are few estimates of higher-rise multi-family C&D generation rates in the literature.

MRSF = 10.4583 + 3.92963 * ln(t) R^2=0.83
(10.09) (6.60)

where:

MRSF = millions of residential square feet

10.4583 = the intercept of the equation computed by least squares regression

ln(t) = the natural logarithm of the variable t, which represents time and takes the value of 1 for 1997, 2 for 1998, and so on through 28 for 2024

3.92963 = the coefficient of the variable ln(t), computed by least squares regression

The values of the t-statistics show the precision with which the intercept and the coefficient of the independent variables have been estimated and are presented in parentheses below the estimated constants. These values indicate significance at a 99% level of confidence. The R^2 indicates the percentage of the overall variation in the data, which is explained by the equation – more than 83% of the variation is explained by this simple estimating equation. This methodology is used to estimate the new square footage of residential construction that is shown in Table 3.2-1.

With respect to demolition debris, given the City's built environment, new construction generally requires the demolition of existing buildings. Most often, the replacement building is larger than the demolished building. A timeline for demolition on any plot of land was hypothesized as a basis for estimating the quantity of residential demolition debris. That timeline is:

- 50% would have been demolished in the year prior to construction;
- 30% two years before construction;
- 10% three years before construction; and
- 10% four years before construction.

The square footage demolished is assumed to equal 90% of new construction. These assumptions generated a time series for residential square feet demolished that closely mirrors that of residential construction. The square feet demolished are multiplied by the per square foot demolition debris factor to estimate residential demolition debris. The residential square feet of demolition are shown in the third column of Table 3.2-1.

Table 3.2-1
Projected Residential Construction, Demolition and Renovation in New York City

Year	Residential Construction (Millions of Square Feet)	Residential Demolition (Millions of Square Feet)	Residential Renovation (Millions of Square Feet)
2000	16.688	15.69	4.75
2001	18.932	16.37	3.93
2002	17.163	15.82	3.10
2003	16.944	16.31	0.52
2004	18.904	17.40	1.06
2005	20.225	17.77	0.44
2006	19.626	17.29	0.80
2007	18.529	16.91	1.26
2008	18.870	17.20	1.36
2009	19.184	17.46	1.51
2010	19.474	17.71	1.69
2011	19.745	17.94	1.91
2012	19.998	18.16	2.17
2013	20.235	18.36	2.45
2014	20.460	18.56	2.76
2015	20.672	18.74	3.10
2016	20.873	18.91	3.46
2017	21.064	19.08	3.85
2018	21.246	19.24	4.26
2019	21.420	19.39	4.70
2020	21.587	19.54	5.16
2021	21.747	19.68	5.64
2022	21.901	19.81	6.14
2023	22.049	19.94	6.66
2024	22.192	20.06	7.21

The square footage demolished is assumed to equal 90% of new construction. These assumptions generated a time series for residential square feet demolished that closely mirrors that of residential construction. The square feet demolished are multiplied by the per square foot demolition debris factor to estimate residential demolition debris. The residential square feet of demolition are shown in the third column of Table 3.2-1.

Data on the square feet of residential renovations are not readily available. However, F.W. Dodge does collect data reporting the total value of residential renovation and new construction for each of the City's boroughs. The estimated square footage of residential renovation can be derived from this overall estimate. (See Attachment 1 for a description of how these computations were performed.)

Residential expenditures for renovation and new construction are projected from 2008 to 2024 at the average rate of growth projected from 2003 to 2007 -- 2.18%. Table 3.2-1 presents estimates of annual square footage of residential renovation, using a generation factor per square foot of residential space renovated, shown in Table 3.1-1. This factor is computed by taking a weighted average of generation rates for different types of remodeling. Kitchens, with an average of 35.5 pounds per square foot, and baths, with an average of 37.5 pounds of waste per square foot, are rooms most frequently remodeled, and they are accorded 40% and 30%, respectively, in the weighted average. The other types of remodeling are: whole house, generating an average of 9 pounds per square foot; roof renovation, generating an average of 4 pounds per square foot; and deck renovation, generating an average of 5.5 pounds per square foot. Each of these categories is weighted 10% in the average. The weighted average debris generation factor is 27.3 pounds per square foot of residential renovation.

3.3 Projected Residential C&D Debris

Estimates of residential C&D debris are presented in Table 3.3-1. The form of the equation used to predict future construction activity in the residential sector is one that does not create any peaks or troughs, but rather generates a steady increase over time. Although the construction industry is known for its cyclical behavior, it is beyond the scope of this Commercial Waste Management Study (Study) to predict when economic cycles will occur. Thus, what will actually occur can be expected to differ from the steady trend predicted in this estimate.

Estimates of residential construction debris increases from 21,003 tons in 1997 to 31,952 in 2000, with further increases occurring at a slower rate of growth. Thus, in 2024, 44,589 tons of residential construction debris are predicted. How much of this material will require disposal will depend on recycling activities. What is certain is that transfer stations will be necessary to process the materials, either for reuse or for disposal.

As indicated in Table 3.1-1, the quantity of demolition debris generated per square foot demolished is much greater than the quantity of debris generated per square foot constructed. (Note: Debris generated during construction is 4.10 pounds per square foot for single-family and 3.99 pounds per square foot for multi-family residential structures, as shown in Table 3.1-1.) For single-family buildings, the average waste per square foot demolished is 85.10 pounds, with a range of 55.20 to 115.00 pounds per square foot. The comparable number for multi-family housing is 50.50 pounds per square foot demolished, with a range of 36.56 to 64.40 pounds. The amount of waste generated by a square foot of demolition is 12 to 20 times the quantity generated from constructing a square foot of residential space.

Estimates of annual generation of residential demolition debris are contained in Table 3.3-1. The estimated quantities increase from 431,526 tons in 1999 to 597,653 in 2024. The estimates are made using a blended waste generation rate, reflecting the mix of multi-family and single-family type housing stock in the City of 59.6 pounds per square foot demolished. The proportion of residential construction debris that will require disposal will depend on recycling activities; however transfer stations will be necessary to process this waste.

Table 3.3-1
Projected Residential Construction, Demolition and Renovation Debris for New York City, 1997-2024

Year	Residential Construction Debris in Tons	Residential Demolition Debris in Tons	Residential Building Renovation Debris in Tons	Total Residential Sector C&D Debris
1997	21,003	NA	NA	NA
1998	26,492	NA	NA	NA
1999	29,686	431,526	96,765	557,977
2000	31,952	467,262	64,865	564,079
2001	33,710	487,773	53,685	575,168
2002	35,146	471,105	42,397	548,648
2003	36,360	485,872	7,180	529,412
2004	37,412	518,212	14,524	570,148
2005	38,339	529,421	6,088	573,848
2006	39,169	515,098	11,029	565,296
2007	37,230	503,626	17,267	558,123
2008	37,915	512,223	18,673	568,811
2009	38,546	520,167	20,652	579,365
2010	39,130	527,549	23,178	589,857
2011	39,673	534,444	26,181	600,298
2012	40,181	540,913	29,621	610,715
2013	40,659	547,006	33,483	621,148
2014	41,109	552,765	37,729	631,603
2015	41,535	558,223	42,329	642,087
2016	41,939	563,410	47,297	652,646
2017	42,323	568,354	52,607	663,284
2018	42,689	573,074	58,231	673,994
2019	43,040	577,592	64,182	684,814
2020	43,375	581,922	70,434	695,731
2021	43,696	586,081	77,000	706,777
2022	44,005	590,082	83,866	717,953
2023	44,302	593,936	91,032	729,270
2024	44,589	597,653	98,485	740,727

As can be observed, residential renovation and construction debris waste quantities are roughly of the same magnitude. Renovation debris peaks in 1999, declines through 2005, and gradually increases through 2024, when it is roughly equivalent to the quantity produced in 1999.

Quantities of residential demolition debris are projected at 8 to 10 times the quantity of residential construction debris. Residential demolition debris increases from approximately 500,000 tons in the early 2000s to just under 600,000 tons per year in 2024. In the aggregate, residential C&D debris from all three activities is projected to increase from approximately 550,000 tons in 1999 to approximately 740,000 tons per year in 2024.

4.0 COMMERCIAL CONSTRUCTION, DEMOLITION AND RENOVATION DEBRIS

4.1 Commercial C&D Generation Factors

Commercial construction, demolition and renovation debris is estimated using a methodology comparable to that used to estimate residential C&D debris. First, waste generation factors specific to construction, demolition and renovation are assembled, using a combination of sources obtained from the literature and surveys of construction firms and C&D haulers in the New York region. Next, the square footage of commercial construction, demolition and renovation is projected through the year 2024. Finally, the appropriate commercial waste generation factor is multiplied by the square footage to estimate C&D generation.

Table 4.1-1 presents the data used to derive waste generation factors. In summary, these averages used to estimate C&D from construction, demolition and renovation are:

- Commercial construction debris at a rate of 3.8 pounds per square foot;
- Commercial demolition at a rate of 130.3 pounds per square foot; and
- Commercial renovation at a rate of 11.3 pounds per square foot.

4.2 Projections of Commercial Construction, Demolition and Renovation Activity

F.W. Dodge provided data indicating the number of square feet of new construction from 1993 to 2002, with predictions through 2007. They also provided dollar expenditures for commercial renovation and construction for the same period. In order to predict the square footage of commercial construction for the period 2008 through 2024, a least squares regression was fitted to the available data, and the resulting equation was used to project forward in time. The square feet of commercial construction within the City between 1993 and 2007 can be estimated using the following equation:

Table 4.1-1
Commercial Construction, Demolition and Renovation Waste Generation Factors

Pounds per Square Foot	Comments	Source
4.11	Commercial construction. New York City data. C&D generation ranges from 0.005-0.01 cubic yards per square foot, which averages 0.0075 cubic yards, converted to pounds as 549 lbs/cy (see Table 2.2-2)	Summary of information provided by local construction contractors.
3.08	Commercial construction. Madison, Wisconsin.	Jenna Kunde and Sonya Newenhouse, "Leading the Way to New C&D Markets," *Resource Recycling,* January 2002.
3.89	Commercial construction. National Data.	Franklin Associates, Ltd. *Characterization of Building-Related Construction and Demolition Debris in the United States,* USEPA, Office of Solid Waste, EPA530-R-98-010, June 1998.
4.10	Commercial construction. Four Times Square, New York City.	USEPA, *Building Savings: Strategies for Waste Reduction of Construction and Demolition Debris from Buildings, June 2000.*
3.80	**Average Commercial Construction**	
116.9	Commercial demolition. Four Times Square, New York City.	USEPA, *Building Savings: Strategies for Waste Reduction of Construction and Demolition Debris from Buildings, June 2000.*
186.2	Commercial demolition. Salem, Oregon.	USEPA, *Building Savings: Strategies for Waste Reduction of Construction and Demolition Debris from Buildings, June 2000.*
155.0	Commercial demolition. National data.	Franklin Associates, Ltd. *Characterization of Building-Related Construction and Demolition Debris in the United States,* USEPA, Office of Solid Waste, EPA530-R-98-010. June 1998.
63.2	Commercial demolition. New York City. 0.088 cubic yards converted @ 711 lbs/cy. (See Attachment 1, Table A-2)	Summary of information provided by local construction contractors. (URS Engineers)
130.3	**Average for Commercial Demolition**	
10.0	Commercial renovation. San Diego, CA.	USEPA, *Building Savings: Strategies for Waste Reduction of Construction and Demolition Debris from Buildings, June 2000.*
7.1	Commercial renovation. Austin, TX.	USEPA, *Building Savings: Strategies for Waste Reduction of Construction and Demolition Debris from Buildings, June 2000.*
16.0	Commercial renovation, New York City. A 2,500-square-foot building generates about 20 tons of C&D debris – or 16 pounds per square foot.	Summary of information provided by local construction contractors.
12.0	Commercial renovation, New York City. A 15,000-square-foot building generates about 90 tons of C&D, or 12 pounds per square foot.	Summary of information provided by local construction contractors.
11.3	**Average for Commercial Renovation**	

$$TCSF = 2891.564 + 4683.209 * \ln(t) \qquad R^2 = .65$$
$$(1.50) \qquad (4.91)$$

where:

TCSF = thousands of commercial square feet constructed

2891.564 = the intercept of the equation computed by least squares regression

ln(t) = the natural logarithm of the variable t, which represents time and takes the value of 1 for 1993, 2 for 1994, and so on through 32 for 2024

4683.209 = the coefficient of the variable ln(t), computed by least squares regression

Values for t-statistics showing the precision with which the intercept and the coefficient of the independent variables have been estimated are presented in parentheses below the estimated constants. The value of the intercept is not significantly different from zero. The coefficient of ln(t) is estimated with sufficient precision that one can be 99% confident that its value is different from zero and positive. The R^2 indicates the percentage of the overall variation in the data which is explained by the equation – more than 65% of the variation is explained by this simple estimating equation. This methodology was used to estimate the new square footage of commercial construction in the City from 1999 to 2024 that is presented in Table 4.2-1.

Because almost all new commercial construction takes place on sites where other buildings once stood, the following assumptions and timeline over which demolition occurs prior to new construction were assumed.

- 70% of commercial construction is preceded by demolition. (This is consistent with either new buildings being larger than the ones they replace and/or with some buildings being constructed on previously long-vacant plots.)
- 50% of the demolition occurs in the year prior to new construction;
- 30% two years before construction;
- 10% three years prior to construction; and
- 10% four years before construction.

Table 4.2-1
Projected Commercial Construction, Demolition and Renovation

Year	Commercial Construction (Thousands of Square Feet)	Commercial Demolition (Thousands of Square Feet)	Commercial Renovation (Thousands of Square Feet)
1999	12,418	9,561	107,651
2000	12,727	10,887	107,570
2001	21,204	12,491	108,120
2002	15,109	10,047	107,828
2003	13,178	9,594	108,114
2004	13,918	9,977	108,430
2005	14,525	10,261	108,771
2006	14,891	10,350	109,134
2007	14,469	10,326	109,466
2008	14,770	10,576	109,805
2009	15,054	10,831	110,153
2010	15,322	11,093	110,509
2011	15,575	11,361	110,873
2012	15,815	11,635	111,247
2013	16,044	11,916	111,629
2014	16,261	12,204	112,021
2015	16,470	12,499	112,422
2016	16,669	12,801	112,833
2017	16,860	13,110	113,253
2018	17,044	13,427	113,684
2019	17,220	13,751	114,126
2020	17,391	14,083	114,578
2021	17,555	14,424	115,040
2022	17,714	14,772	115,515
2023	17,867	15,129	116,000
2024	18,016	15,494	116,497

These assumptions are the basis of a time series projecting the square feet of commercial space demolished in the City each year, as a function of the square feet constructed in each of the next four years. That time series is presented in Table 4.2-1.

Projections of commercial square footage renovated in the City involved the following steps:

1. Data on number of employees in broad categories of employment were developed for the City.
2. A literature search yielded estimates of the square feet of workspace per employee in specific employment categories.
3. The number of employees and square foot per employee yielded an estimate of the total amount of commercial space in the City.
4. It was assumed that 8% of the City's commercial space was renovated each year.

Table 4.2-2 presents the factors used to derive total estimated square footage by employment category. Attachment 2 to this report provides a more detailed description of this methodology.

Table 4.2-2
Estimated Commercial Space in New York City

Type of Employment	Commercial Floor Space in Northeast (Millions of Square Feet)[1][2]	Thousands of Employees in Northeast[1][3]	Square Feet Per Employee	Thousands of Employees In New York City[3]	Estimated Commercial Floor Space in New York City (Millions of Square Feet)
Education and Health Services	2,162	3,949	547	626.2	342.8
Transportation, trade and utilities	3,156	4,693	672	526.1	353.8
Hospitality and leisure	1,807	1,888	957	576.4	551.8
Office	2,389	8,524	280	1,578.2	442.3
Total	**9,514**	**19,054**	**499**	**3,306.9**	**1,690.7**

Notes:

(1) Northeast Region includes Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont in New England, and New Jersey, New York and Pennsylvania in the Middle Atlantic Regions.

(2) Commercial square feet of floor space from Department of Energy, Energy Information Administration, 1999. Commercial Buildings Energy Consumption Survey: Building Characteristics Table B3: Census Region, Number of Buildings and Floor space, 1999.

(3) Number of employees from Bureau of Labor Statistics, Current Employment Statistics Survey, Table 5. Employees on non-farm payrolls by state and selected industry division, for the Northeast Region. Number of employees from Bureau of Labor Statistics, Current Employment Statistics Survey. Current Employment by Industry for New York City.

The estimates appear reasonable. Office space is estimated at 442.3 million square feet for the year 2002. This total compares relatively closely with that reported by the Citizen's Budget Commission -- 408.6 million square feet in 1999. The total commercial square footage in the City is estimated at 1,690.7 million square feet in 2002. Because DSNY collects from educational and institutional customers, these categories were excluded from the above square footage estimates. Then, for each year going forward from 2002, the aggregate commercial square footage is computed as the previous year's total, plus the new construction in the current year, less the demolition in the current year. A similar computation to subtract net additions is employed to move back to years before 2002.

Once the aggregate commercial square footage is computed for each year from 1999 to 2024, the estimated square footage that is renovated is computed. Usually, commercial space is renovated when there is a change in tenancy, e.g., at the end of a lease which is not renewed, or when a restaurant goes out of business and is replaced with another restaurant or business of a different type. Some space may go several decades without renovation, while other spaces may turn over and consequently be renovated several times a decade. The analysis assumes that 8% of the commercial space is renovated each year.[5] Thus, for 2002, the aggregate commercial space in the City is 1,690.7 million square feet, less the space in the education and health services industry (342.8 million square feet), or 1,347.9 million square feet. Eight percent (8%) of this space amounts to 107,828 square feet. The figures represent 8% of commercial space excluding education and health services space.

4.3 Projected Commercial C&D Debris

The final computation necessary to estimate C&D debris for commercial construction, demolition and renovation is to multiply the square feet presented in Table 4.2-1 by the average generation factors presented in Table 4.1-1. These results are presented below in Table 4.3-1.

[5] This figure was obtained in the course of conversations with property managers of office buildings. Information about other types of commercial buildings was not available.

Table 4.3-1
Projected Commercial Construction, Demolition and Renovation Debris in New York City, 1999-2024

Year	Commercial Construction (Tons)	Commercial Demolition (Tons)	Commercial Renovation (Tons)	Commercial Total (Tons)
1999	23,563	622,924	606,884	1,253,371
2000	24,149	709,347	606,425	1,339,921
2001	40,234	813,838	609,525	1,463,597
2002	28,670	654,580	607,879	1,291,129
2003	25,005	625,097	609,495	1,259,597
2004	26,409	650,021	611,273	1,287,703
2005	27,560	668,533	613,196	1,309,289
2006	28,255	674,335	615,244	1,317,834
2007	27,455	672,804	617,112	1,317,371
2008	28,118	689,057	619,025	1,336,200
2009	28,797	705,702	620,985	1,355,484
2010	29,493	722,750	622,992	1,375,235
2011	30,205	740,209	625,047	1,395,461
2012	30,935	758,089	627,152	1,416,176
2013	31,682	776,403	629,308	1,437,393
2014	32,447	795,158	631,516	1,459,121
2015	33,231	814,366	633,778	1,481,375
2016	34,034	834,039	636,094	1,504,167
2017	34,856	854,186	638,466	1,527,508
2018	35,698	874,820	640,895	1,551,413
2019	36,560	895,953	643,383	1,575,896
2020	37,444	917,596	645,931	1,600,971
2021	38,348	939,762	648,541	1,626,651
2022	39,285	962,464	651,213	1,652,962
2023	40,223	985,714	653,950	1,679,887
2024	41,195	1,009,525	656,754	1,707,474

Note:

Because data presented in Tables 4.1-1 and 4.2-2 are rounded, and the data in Table 4.3-1 are computed from underlying spreadsheets where data are not rounded, a simple multiplication of waste generation factors by square feet, and adjusting for tons rather than pounds, will yield slightly different estimates than those presented in Table 4.3-1. For example, for 1999, commercial construction of 3.8 pounds per square foot multiplied by 12,418 thousand square feet yields an estimated C&D tonnage of 23,594 tons for that year. The computation reflected in the table above is actually 12,417.8 x 3.795 x 1000/2000= 23,563 tons.

Demolition and renovation account for almost all of the C&D debris in the commercial sector. For example, in 1999, commercial construction is 2% of all commercial sector C&D debris, while demolition accounts for just under half, and renovation accounts for the remaining approximately 48%.

Commercial demolition debris is projected to increase from 622,924 tons in 1999 to 1,009,525 tons by the year 2024. In that year it would amount to 60% of the aggregate C&D debris from the commercial sector. In 1999, commercial C&D debris totaled 1,253,371 tons; it is projected to increase to approximately 1,707,474 tons by 2024. Commercial construction debris is relatively small, whereas commercial demolition and renovation account for roughly equal proportions of the commercial waste stream and together account for almost 98% of all commercial C&D debris.

5.0 SUMMARY OF RESULTS FOR BUILDING-RELATED C&D

Table 5-1 summarizes the estimates of building-related C&D debris for both the residential and commercial sectors. C&D debris was more than 1.75 million tons in each of the last five years. The building-related C&D debris peaked in 2001 at 2.04 million tons, and then decreased rapidly in 2002 and 2003 with the recession. On a per capita basis, the City generates between 0.228 and 0.253 tons of building-related C&D debris per resident.

Table 5-1
Building-Related C&D Debris

Item	1999	2000	2001	2002	2003
Residential:					
Construction	29,686	31,952	33,710	35,146	36,360
Demolition	431,526	467,262	487,773	471,105	485,872
Renovation	96,765	64,865	53,685	42,397	7,180
Subtotal	557,977	564,079	575,168	548,648	529,412
Commercial:					
Construction	23,563	24,149	40,234	28,670	25,005
Demolition	622,924	709,347	813,838	654,580	625,097
Renovation	606,884	606,425	609,525	607,879	609,495
Subtotal	1,253,371	1,339,921	1,463,597	1,291,129	1,259,597
Total	1,811,348	1,904,000	2,038,765	1,839,777	1,789,009
City Population [(1)]	7,947,660	8,108,546	8,062,027	8,084,316	
Per capita building debris	0.22791	0.23481	0.25288	0.22757	

Notes:
(1) 1999 population from Bureau of Economic Analysis, Population and Income Survey; 2000, 2001 and 2002 population data from U.S. Census Bureau, GCT-T1. Population Estimates.

Table 5-2 shows a breakdown of the quantities of commercial and residential C&D projected for the New SWMP Planning Period.

Table 5-2
Total Projected Building-Related C&D Debris, 2000-2024

Year	Commercial C&D Debris Total	Residential C&D Debris Total	Total Building-Related C&D
2000	1,340,000	564,000	1,904,000
2001	1,464,000	575,000	2,039,000
2002	1,291,000	549,000	1,840,000
2003	1,260,000	529,000	1,789,000
2004	988,000	570,000	1,558,000
2005	1,309,000	574,000	1,883,000
2006	1,318,000	565,000	1,883,000
2007	1,317,000	558,000	1,875,000
2008	1,336,000	569,000	1,905,000
2009	1,355,000	579,000	1,935,000
2010	1,375,000	590,000	1,965,000
2011	1,395,000	600,000	1,996,000
2012	1,416,000	611,000	2,027,000
2013	1,437,000	621,000	2,059,000
2014	1,459,000	632,000	2,091,000
2015	1,481,000	642,000	2,123,000
2016	1,504,000	653,000	2,157,000
2017	1,528,000	663,000	2,191,000
2018	1,551,000	674,000	2,225,000
2019	1,576,000	685,000	2,261,000
2020	1,601,000	696,000	2,297,000
2021	1,627,000	707,000	2,333,000
2022	1,653,000	718,000	2,371,000
2023	1,680,000	729,000	2,409,000
2024	1,707,000	741,000	2,448,000

6.0 NON-BUILDING-RELATED C&D

Non-building debris includes waste materials generated in the process of constructing, demolishing and renovating bridges; dams, reservoirs and river banks; power plants and gas and communications facilities; sewerage and waste disposal facilities; streets and highways; water supply systems; and "other" non-building activities. Data on the value of this construction in the City from 1993 to 2007 (the 2003 through 2007 data are projections) were obtained from F.W. Dodge, McGraw Hill Construction. The data are expressed in constant 1996 dollars.

6.1 Methodology

Non-building debris generation resulted from the expenditure of $1.5 billion dollars in the City in 1993, increasing to a maximum of $3.4 billion in 2002. The methodology to estimate the quantity of debris associated with these expenditures is as follows:

1. Obtain the total quantity of C&D and non-building debris from the City's non-putrescible and fill material Transfer Stations for 2000, 2001 and 2002, and available data from 2003.
2. Estimate the quantity of non-building-related C&D debris by subtracting the estimated building-related C&D debris for each of these years from the City total.
3. Subtract the building-related C&D debris generation from the total of all reported debris generation (both C&D and non-building-related as used herein) to obtain an estimate of non-building debris generation.
4. Correlate the tons of non-building debris generation in each of the years to the dollar value of non-building debris-generating activities (tons per thousand dollars of expenditures on non-building-related construction, demolition and renovation).
5. Average these ratios for the three years.
6. Based on F.W Dodge data, project the City's expenditures for non-building-related construction, demolition and renovation using a least squares equation estimated over the period 1993 to 2007, projecting forward to 2024.
7. Use the average tons per thousand dollars of expenditures on non-building construction, demolition and renovation to estimate non-building debris quantities for the City for the period through 2024.

6.1.1 Deriving Non-Building-Related Debris Generation Factors

Table 6.1.1-1 presents the data used to compute the tons of non-building debris per thousand dollars of expenditures on the activities generating these waste materials. Starting with the total C&D estimates in Table 7.1-1, the building-related component, as presented in Table 5-2 is subtracted to estimate the non-building related component. The non-building component is then divided by the F.W. Dodge estimated value of non-building construction (in 1996 dollars), which yields a factor of non-building related debris per $1,000 of expenditure. Reported total annual C&D debris generation increased from 6.4 million tons in 2000 to an estimated 8.6 million tons in 2003. For the three years with full data available (2000 – 2002), the non-building-related debris generation factor is 1.96 tons per thousand dollars of expenditures on such projects. For the year 2003, the rate increases to 2.97 tons per $1,000 expenditure.

6.1.2 Projecting Non-Building Debris Generation

F.W. Dodge provided data for the City indicating the dollars of activity in non-building construction from 1993 to 2002, with predictions through 2007. In order to predict non-building activity for the period 2008 through 2024, a least squares regression is fitted to the available data. The resulting equation is used to project forward in time. The value of non-building-related construction, demolition and renovation activity within the City between 1993 and 2007 can be estimated using the following equation:

$$TDNBA = 14.1419 + 0.20628 * \ln(t) \qquad R^2 = .50$$

(123.42) (3.61)

where:

TDNBA = thousands of constant dollars of activity in non-building-related construction, demolition and renovation

14.1419 = the intercept of the equation computed by least squares regression

ln(t) = the natural logarithm of the variable t, which represents time and takes the value of 1 for 1993, 2 for 1994, and so on through 32 for 2024

0.20628 = the coefficient of the variable ln(t), computed by least squares regression

Table 6.1.1-1
Non-Building-Related Debris Generation Factors

Item	Applicable Year				
	2000	2001	2002	Average (2000-2002)	2003
Total C&D (building & non-building) debris: Generated[(1)]	6,354,270	6,689,592	7,905,924	NA	8,640,840
Aggregate building debris generation[(2)]	1,904,000	2,038,765	1,839,777	NA	1,789,009
Estimated tons of non-building-generated debris[(3)]	4,450,270	4,650,827	6,066,147	NA	6,851,831
Value of non-building-related construction, demolition and renovation[(4)]	$2,535,203	$2,079,637	$3,236,764	NA	$2,306,670
Tons of non-building-related debris per $1,000 of expenditure	1.76	2.24	1.87	1.96	2.97

Notes:
(1) From DSNY Quarterly Transfer Station Reports.
(2) See Table 5-1.
(3) Obtained by subtracting building-related C&D debris from total C&D debris.
(4) Data obtained from F.W. Dodge, McGraw Hill Construction. In thousands of 1996 constant dollars.

The value for the t-statistics, in parentheses below the estimated constants, shows the precision with which the intercept and the coefficient of the independent variables have been estimated. The value of the intercept is significantly different from zero, at a 99% confidence level. The coefficient of ln(t) is estimated with sufficient precision that one can be 99% confident that its value is different from zero and positive.

The R^2 indicates the percentage of the overall variation in the data which is explained by the equation – 50% of the variation is explained by this simple estimating equation.

Table 6.1.2-1 presents the dollar value of non-building-related construction, demolition and renovation in the City from 1999 to 2024. This table also contains the estimated tons of non-building-related C&D debris, which will be generated as a result of the predicted level of economic activity, based both upon the average level for the years 2000 – 2002 (1.96 tons per $1,000) as well as for the latest level determined for the year 2003, or 2.97 tons per $1,000 expended on non-building-related construction, demolition and renovation. The quantity of non-building-related C&D tons is projected to decline in 2004, and then increase steadily over the New SWMP Planning Period.

Table 6.1.2-1
Projected Non-Building-Related Construction, Demolition and Renovation Debris in New York City, 2000-2024

Year	Value of Non-Building-Related Construction (000s of 1996 $)	Non-Building-Related C&D Debris[(1)] (1.96 * Value) (Tons)	Non-Building-Related C&D Debris (2.97 * Value) (Tons)
2000	$2,535,203	4,450,000	NA
2001	$2,079,637	4,651,000	NA
2002	$3,236,764	6,066,000	NA
2003	$2,306,670	NA	6,852,000
2004	$2,143,400	4,201,000	6,366,000
2005	$2,177,569	4,268,000	6,467,000
2006	$2,281,721	4,472,000	6,777,000
2007	$2,340,870	4,588,000	6,952,000
2008	$2,455,527	4,813,000	7,293,000
2009	$2,486,428	4,873,000	7,385,000
2010	$2,515,918	4,931,000	7,472,000
2011	$2,544,135	4,987,000	7,556,000
2012	$2,571,197	5,040,000	7,636,000
2013	$2,597,205	5,091,000	7,714,000
2014	$2,622,248	5,140,000	7,788,000
2015	$2,646,404	5,187,000	7,860,000
2016	$2,669,739	5,233,000	7,929,000
2017	$2,692,316	5,277,000	7,996,000
2018	$2,714,186	5,320,000	8,061,000
2019	$2,735,399	5,361,000	8,124,000
2020	$2,755,997	5,402,000	8,185,000
2021	$2,776,019	5,441,000	8,245,000
2022	$2,795,500	5,479,000	8,303,000
2023	$2,814,473	5,516,000	8,359,000
2024	$2,832,965	5,553,000	8,414,000

Notes:
(1) Utilized actual tons of non-building-related debris per $1,000 of expenditure for the years 2000-2002, from Table 6.1.1-1.

7.0 SUMMARY OF TOTAL C&D ESTIMATES AND CONCLUSIONS

7.1 Summary of Estimated Total C&D Generation

The previous sections have provided separate estimates for residential, commercial and non-building-related debris generation in the City. Table 7.1-1 summarizes the estimates derived for residential and commercial building-related C&D debris, and the non-building-related C&D, which together constitute total C&D waste. The total estimated building-and non-building-related C&D for 2003 is shown to be 8,641,000, as reported in the 2003 Quarterly Reports, with the fourth quarter estimated as mentioned previously in this report. This quantity was utilized for the baseline in projecting waste quantities for the New SWMP Planning Period. A low-to-high range is shown in this table to account for the differences between data for non-building-related C&D for the years 2000 to 2002 and for 2003, as discussed in the previous section. Relative quantities of building-related residential and commercial waste and non-building-related materials will vary over time in accordance with the methodologies previously described.

As discussed in Section 2.3, clean fill has historically constituted approximately 60% of the total quantity of C&D material, but in 2003 constituted almost 70% of total C&D. Hence, both of these percentages were utilized in Tables 7.1-2 through 7.1-5, which disaggregate the total estimate for C&D debris into the clean fill and non-putrescible categories used by the City in regulating its Transfer Stations. Tables 7.1-2 and 7.1-3 utilize the lower estimate of 1.96 tons per $1,000 expended, and show non-putrescible material ranging from 2.4 to 3.2 million tons in 2024 (or 7,690 to 10,260 tpd). Clean fill material would range from 4.8 to 5.6 million tons, or 15,390 to 17,950 tpd. Tables 7.1-4 and 7.1-5 utilize the higher estimate of 2.97 tons per $1,000 for non-building-related material expended, and show quantities of non-putrescible waste ranging from approximately 3.3 to 4.3 million tons in 2024, or 10,440 to 13,930 tons per day. Clean fill material would range from 6.5 to 7.6 million tons per year, or 20,890 to 24,370 tons per day.

Table 7.1-1
Aggregate Estimate of C&D Debris, 2000 to 2024[(1)]

Year	Total C&D Debris			
	Average (2000-2002) Estimate (Using 1.96)	Upper Estimate (Using 2.97)	Average (2000-2002) Estimate (Using 1.96)	Upper Estimate (Using 2.97)
	(Tons)	(Tons)	(tpd)	(tpd)
2000[(2)]	6,354,000	NA	20,400	NA
2001[(2)]	6,690,000	NA	21,400	NA
2002[(2)]	7,906,000	NA	25,300	NA
2003[(2)]	NA	8,641,000	NA	27,700
2004	5,759,000	7,924,000	18,500	25,400
2005	6,151,000	8,351,000	19,700	26,800
2006	6,355,000	8,660,000	20,400	27,800
2007	6,464,000	8,828,000	20,700	28,300
2008	6,718,000	9,198,000	21,500	29,500
2009	6,808,000	9,320,000	21,800	29,900
2010	6,896,000	9,437,000	22,100	30,200
2011	6,982,000	9,552,000	22,400	30,600
2012	7,066,000	9,663,000	22,600	31,000
2013	7,149,000	9,772,000	22,900	31,300
2014	7,230,000	9,879,000	23,200	31,700
2015	7,310,000	9,983,000	23,400	32,000
2016	7,390,000	10,086,000	23,700	32,300
2017	7,468,000	10,187,000	23,900	32,700
2018	7,545,000	10,287,000	24,200	33,000
2019	7,622,000	10,385,000	24,400	33,300
2020	7,698,000	10,482,000	24,700	33,600
2021	7,774,000	10,578,000	24,900	33,900
2022	7,850,000	10,674,000	25,200	34,200
2023	7,926,000	10,768,000	25,400	34,500
2024	8,001,000	10,862,000	25,600	34,800

Notes:

(1) This table was derived by determining the annual changes for each of the discrete categories of waste (e.g., residential construction, renovation, etc.), quantifying the aggregate annual change and applying those changes to the 2003 baseline number.

(2) The actual tons of non-building-related debris per $1,000 of expenditure was utilized for the years 2000-2003, as derived in Table 6.1.1-1.

Table 7.1-2
Range of Quantities of Non-Putrescible and Fill Material, 2004-2024
(based upon average data for 2000-2002, in tons per year)

	Average (2000-2002) Estimate (Using 1.96)			
Year	Non-Putrescible		Fill	
	30%	40%	60%	70%
2004	1,728,000	2,304,000	3,455,000	4,031,000
2005	1,845,000	2,460,000	3,691,000	4,306,000
2006	1,907,000	2,542,000	3,813,000	4,449,000
2007	1,939,000	2,585,000	3,878,000	4,525,000
2008	2,015,000	2,687,000	4,031,000	4,702,000
2009	2,042,000	2,723,000	4,085,000	4,766,000
2010	2,069,000	2,759,000	4,138,000	4,827,000
2011	2,095,000	2,793,000	4,189,000	4,888,000
2012	2,120,000	2,827,000	4,240,000	4,947,000
2013	2,145,000	2,860,000	4,289,000	5,004,000
2014	2,169,000	2,892,000	4,338,000	5,061,000
2015	2,193,000	2,924,000	4,386,000	5,117,000
2016	2,217,000	2,956,000	4,434,000	5,173,000
2017	2,240,000	2,987,000	4,481,000	5,227,000
2018	2,264,000	3,018,000	4,527,000	5,282,000
2019	2,287,000	3,049,000	4,573,000	5,335,000
2020	2,310,000	3,079,000	4,619,000	5,389,000
2021	2,332,000	3,110,000	4,665,000	5,442,000
2022	2,355,000	3,140,000	4,710,000	5,495,000
2023	2,378,000	3,170,000	4,755,000	5,548,000
2024	2,400,000	3,200,000	4,800,000	5,601,000

Table 7.1-3
Range of Quantities of Non-Putrescible and Fill Material, 2004-2024
(based upon average data for 2000-2002, in tons per day)

Year	Average (2000-2002) Estimate (Using 1.96)			
	Non-Putrescible		Fill	
	30% (tpd)	40% (tpd)	60% (tpd)	70% (tpd)
2004	5,540	7,380	11,070	12,920
2005	5,910	7,890	11,830	13,800
2006	6,110	8,150	12,220	14,260
2007	6,210	8,290	12,430	14,500
2008	6,460	8,610	12,920	15,070
2009	6,550	8,730	13,090	15,270
2010	6,630	8,840	13,260	15,470
2011	6,710	8,950	13,430	15,670
2012	6,790	9,060	13,590	15,850
2013	6,870	9,170	13,750	16,040
2014	6,950	9,270	13,900	16,220
2015	7,030	9,370	14,060	16,400
2016	7,110	9,470	14,210	16,580
2017	7,180	9,570	14,360	16,750
2018	7,260	9,670	14,510	16,930
2019	7,330	9,770	14,660	17,100
2020	7,400	9,870	14,800	17,270
2021	7,480	9,970	14,950	17,440
2022	7,550	10,060	15,100	17,610
2023	7,620	10,160	15,240	17,780
2024	7,690	10,260	15,390	17,950

Table 7.1-4
Range of Quantities of Non-Putrescible and Fill Material, 2004-2024
(based upon 2003 data, in tons per year)

Year	Upper Estimate (Using 2.97)			
	Non-Putrescible		Fill	
	30%	40%	60%	70%
2004	2,377,000	3,169,000	4,754,000	5,547,000
2005	2,505,000	3,340,000	5,010,000	5,845,000
2006	2,598,000	3,464,000	5,196,000	6,062,000
2007	2,648,000	3,531,000	5,297,000	6,180,000
2008	2,759,000	3,679,000	5,519,000	6,439,000
2009	2,796,000	3,728,000	5,592,000	6,524,000
2010	2,831,000	3,775,000	5,662,000	6,606,000
2011	2,866,000	3,821,000	5,731,000	6,686,000
2012	2,899,000	3,865,000	5,798,000	6,764,000
2013	2,932,000	3,909,000	5,863,000	6,841,000
2014	2,964,000	3,952,000	5,927,000	6,915,000
2015	2,995,000	3,993,000	5,990,000	6,988,000
2016	3,026,000	4,034,000	6,052,000	7,060,000
2017	3,056,000	4,075,000	6,112,000	7,131,000
2018	3,086,000	4,115,000	6,172,000	7,201,000
2019	3,115,000	4,154,000	6,231,000	7,269,000
2020	3,145,000	4,193,000	6,289,000	7,337,000
2021	3,173,000	4,231,000	6,347,000	7,405,000
2022	3,202,000	4,269,000	6,404,000	7,471,000
2023	3,230,000	4,307,000	6,461,000	7,538,000
2024	3,259,000	4,345,000	6,517,000	7,603,000

Table 7.1-5
Range of Quantities of Non-Putrescible and Fill Material, 2004-2024
(based upon 2003 data, in tons per day)

Year	Upper Estimate (Using 2.97)			
	Non-Putrescible		Fill	
	30% (tpd)	40% (tpd)	60% (tpd)	70% (tpd)
2004	7,620	10,160	15,240	17,780
2005	8,030	10,710	16,060	18,740
2006	8,330	11,100	16,650	19,430
2007	8,490	11,320	16,980	19,810
2008	8,840	11,790	17,690	20,640
2009	8,960	11,950	17,920	20,910
2010	9,070	12,100	18,150	21,170
2011	9,180	12,250	18,370	21,430
2012	9,290	12,390	18,580	21,680
2013	9,400	12,530	18,790	21,920
2014	9,500	12,670	19,000	22,160
2015	9,600	12,800	19,200	22,400
2016	9,700	12,930	19,400	22,630
2017	9,800	13,060	19,590	22,860
2018	9,890	13,190	19,780	23,080
2019	9,990	13,310	19,970	23,300
2020	10,080	13,440	20,160	23,520
2021	10,170	13,560	20,340	23,730
2022	10,260	13,680	20,530	23,950
2023	10,350	13,810	20,710	24,160
2024	10,440	13,930	20,890	24,370

7.2 Comparison to Other Jurisdiction

C&D debris can be expressed as pounds per capita per day, facilitating comparisons across jurisdictions. Table 7.2-1 presents comparative data for various jurisdictions. The data presented in this report estimate building-related C&D debris for the City in 2000 at 1.29 pounds per capita per day and 1.25 pounds per capita per day in 2002. The slight decrease is due to a decrease in construction and renovation attributable to the economic recession. Overall, including non-building debris, C&D debris increased from 4.64 pounds per capita per day in 2000 to 5.54 pounds per capita per day in 2002. This increase is due to the extra debris from 9/11 and to a slight decrease in the City's population in the interval.

The estimates presented for other jurisdictions include two for the United States and one for Massachusetts. With the exception of the United States estimate published by Chartwell, all the sources are in the 4.0 to 5.5 pounds per capita per day range. The United States estimate is almost 8 pounds per capita per day. This obviously reflects rural areas, where the quantity of asphalt per resident is undoubtedly greater than in strictly urban areas such as the City. The estimates from this report coincide closely with those in the 2000 Preliminary Report and the 2002 update of the Preliminary Report. These reports provide daily tons of non-putrescible waste, daily tons of clean fill, and recyclables. A per capita C&D debris estimate derived from these data is 4.29 and 4.85 pounds per capita per day for 2000 and 2002, respectively.[6]

[6] Including material delivered to a rock crushing plant at Fresh Kills Landfill, where clean fill and aggregates that are processed and recycled on site increases the C&D per capita by 0.09 pound in 2000 and 0.07 pounds in 2002.

Table 7.2-1
Comparative Data on Construction and Demolition Debris Generation

Jurisdiction	Year	Pounds per Capita per Day		Source
		Building-Related C&D Debris	Total C&D Debris	
New York City	2000	1.29	4.64	This report
New York City	2002	1.25	5.54	This report
New York City	2000	NA	4.29	(1)
New York City	2002	NA	4.85	(2)
United States	1996	2.8	NA	(3)
United States	2002	NA	7.84	(4)
Massachusetts	2001	NA	4.99	(5)

Sources:

(1) Data obtained from New York City Department of Sanitation and Urbitran Associates, Inc., *New York City Comprehensive Commercial Waste Management Study, Preliminary Report.* New York City Department of Sanitation. June 2002. Appendices. Tonnages for individual Transfer Stations were summed to obtain the annual totals. Increase the pounds per capita per day by 0.09 to account for materials processed at the rock crushing plant at Fresh Kills Landfill.

(2) Update of Preliminary Report. {[(23116.47*312) – 60000)]*2000/365}/8084316. Increase the pounds per capita per day by 0.07 to account for materials processed at the rock crushing plant at Fresh Kills Landfill.

(3) Franklin Associates, *Characterization of Building-Related Construction and Demolition Debris in the United States.* USEPA, Municipal and Industrial Solid Waste Division, Office of Solid Waste, # EPA 530-R98-010. June 1998.

(4) Chartwell Information, *Solid Waste Digest.* Vol 13, Number 7-8 (July/August 2003) p. 1. 153,430,312 tons of C&D at landfills or other waste disposal sites, plus an estimated 100,000,000 tons of concrete and 150,000,000 tons of asphalt (97% of which is recycled).

(5) Massachusetts Department of Environmental Protection, *Beyond 2000 Solid Waste Master Plan,* Section 1: 2001 Solid Waste Data and Waste Management Capacity Projections.

Franklin Associates' 1998 report for the United States Environmental Protection Agency (USEPA) estimates only building-related C&D debris. Their estimate of 2.8 pounds per capita per day is significantly higher than that obtained from any other jurisdiction. However, it should be noted that their methodology did not allow for any on-site use of C&D debris. They assumed that all C&D generated in the course of construction, demolition or renovation would be hauled off to a disposal site. In fact, much of the excavation and fill material created in building or demolishing a structure is frequently put to use for site grading and preparation of roadbeds or driveway beds. Thus, it is to be expected that estimates derived using this methodology would be greater than those estimating only those materials delivered to a disposal site.

One final comment is appropriate concerning the quantity of C&D debris in the City. Only those materials delivered to Transfer Stations are included in these totals. In renovating large buildings, it is not uncommon for many appliances and fixtures to be stripped from the building and taken to a recycling center – bathroom fixtures are often recycled in this way – and they are some of the heaviest components of C&D debris. This would be an additional explanation as to why the Franklin Associate estimates would exceed those of jurisdictions measuring C&D debris as delivered to the disposal site.

Attachment 1

Construction and Demolition Debris Density Derivations and Discussion and Note on Calculation of Residential Renovation Activity

C&D DEBRIS ESTIMATION METHODOLOGY

A.1 Non-Putrescible Mixed C&D Estimations (From Licensed New York City Non-Putrescible Transfer Stations)

All private non-putrescible Transfer Stations in the City are required to provide quarterly reports to the DSNY on the quantities of materials received, processed, recycled and disposed. In 2003, four (4) of these Transfer Stations did not use scales to weigh inbound loads; they estimate tons by multiplying the cubic yards received by a density factor (lbs/cy). The density factor for C&D debris that these Transfer Stations have been instructed to use is 1,500 lbs/cy.[1] By 2003, approximately 80% of C&D handled by non-putrescible Transfer Stations was weighed.

In order to more accurately estimate C&D debris tonnages, an analysis of typical weights of C&D loads in the City was conducted with the cooperation of Waste Management at their facility at 123 Varick Street in Brooklyn. The analysis consisted of recording the volume, type of C&D debris and weight of more than 500 loads during one week in July 2003. From these data, density factors were computed for the following types on inbound C&D loads:

- Residential and commercial construction;
- Demolition and renovation debris, and
- Non-building debris.

Table A-1 presents the results of this analysis. There is a very wide range in the density of C&D debris. For commercial construction debris, for example, the average density was 532 pounds, with a range of 77 to 2,536 pounds. The standard deviations of the samples are typically relatively large – ranging from one third of the sample mean to almost as large as the mean itself.

[1] This is the density factor for C&D provided by the NYSDEC.

Table A-1
C&D Debris Density in New York City, July 2003

Item	Pounds per Cubic Yard by Type of C&D Debris				
	Single-Family	Multi-Family	Commercial	Non-Building	Other
Construction (*n*)[1]	*40*	*48*	*112*	*23*	*9*
Average	517	481	532	881	446
Standard deviation	270	296	404	790	225
Minimum	62	116	77	227	160
Maximum	1,345	1,535	2,536	3,512	842
Demolition (*n*)	*57*	*55*	*131*	*33*	*15*
Average	656	546	582	610	542
Standard deviation	433	269	522	421	482
Minimum	152	173	55	136	91
Maximum	2,110	1,188	2,422	2,629	1,707
Renovation (*n*)	*35*	*44*	*50*	*8*	*14*
Average	470	476	461	860	707
Standard deviation	304	251	264	1,223	549
Minimum	54	27	121	177	39
Maximum	1,518	1,188	1,168	3,864	1,679
Other (*n*)	*6*	*5*	*16*	*NA*	*5*
Average	337	494	365	NA	272
Standard deviation	122	486	210	NA	176
Minimum	206	106	79	NA	87
Maximum	553	1,319	768	NA	559

Note:
[1] *n = Number of samples.*

The data in Table A-1 are somewhat useful in determining the density of C&D debris. However, given the wide variance in density factors observed here, and given that this Transfer Station is one of the few C&D Transfer Stations with a scale, additional sources were desired.[2] Accordingly, literature searches and interviews with selected C&D haulers operating in the City were conducted to identify additional sources of data for comparison with this sample data. The density data from these sources are displayed in Table A-2.

[2] The Varick Street Transfer Station has a scale. Many Transfer Stations receiving C&D debris do not have scales. It is possible that drivers with loads of particularly heavy materials would go to the Transfer Stations without scales.

Table A-2
C&D Densities, Multiple Sources

Type of C&D	Pounds/Cubic Yard	Source & Comments
Single-Family Construction	517 160 350 Average = 342	New York City data (1) Probably single-family (2) Probably single-family (3)
Single-Family Renovation	470 433 133 Average = 345	New York City data (1) New York City data (4) New York City data (5)
Single-Family Demolition	656 150 930 472 Average = 552	New York City data (1) Unknown location (6) Unknown location (7) Shredded residential material (6)
Commercial/Multi-Family Construction	481 532 600 581 Average = 549	New York City multi-family (1) New York City commercial (1) New York City commercial (4) New York City commercial (9)
Commercial/Multi-Family Renovation	461 476 Average = 469	New York City multi-family (1) New York City commercial (1)
Commercial/Multi-Family Demolition	546 582 867 850 Average = 711	New York City multi-family (1) New York City commercial (1) New York City commercial (4) New York City commercial (8)
Non Building Construction, Renovation and Demolition	881 610 860 950 Average = 825	New York City construction (1) New York City demolition (1) New York City renovation (1) New York City non-building (9)

Sources:

(1) New York City Data Collection, Varick Street, July 2003.
(2) Peter Yost, "C&D/Wood Debris Management Trends," *Resource Recycling,* November 1998.
(3) National Association of Home Builders Research Center, "Does Grinding and Buying at the Construction Site Work?" *Construction Materials Recycler,* February 12, 1999.
(4) Interview with Boro Wide Recycling, New York City (Michael Christina).
(5) Interview with Alta Recycling, New York City (Omar Diez).
(6) Shred Max web site http://www.shredmax.com.
(7) Bette K. Fishbein, Building for the Future: Strategies to Reduce Construction and Demolition Waste in Municipal Projects, INFORM Special Report, June 1998.
(8) Interview with Kids Waterfront Corporation (Louis Sanzo).
(9) One week's worth of C&D load tickets, from Point Recycling.

As shown in Table A-2, density figures from the literature and interviews are generally lower than those derived from the Varick Street observations.

Table A-2 combines and summarizes the data obtained from all sources for specific types of C&D and non-building materials. Averaging the data on density from all sources for specific material types results in estimated densities as follows:

- Single-family residential construction at 342 lbs/cy.
- Single-family residential renovation at 345 lbs/cy.
- Single-family residential demolition at 552 lbs/cy.
- Commercial and multi-family construction at 549 lbs/cy.
- Commercial and multi-family renovation at 469 lbs/cy.
- Commercial and multi-family building demolition debris at 711 lbs/cy.
- Non-building construction, renovation and demolition at 825 lbs/cy, obtained from the survey at a non-putrescible Transfer Station, which receive mainly mixed C&D waste. The City also licenses clean fill Transfer Stations. Most of the material they receive is heavy concrete, asphalt, rocks and dirt, with weights per cubic yard in the 2,400 pound range. Many of these stations report incoming tons as mixed C&D, which the DSNY converts to tons at the 1,500-pounds-per-cubic-yard factor described above. If the unweighed C&D debris at the non-putrescible Transfer Stations is in the 800-pounds-per-cubic-yard density range, and that at the fill material Transfer Stations in the 2,200-pounds-per-cubic-yard density range, then an average of 1,500 pounds for both stations appears reasonable.

A.2 Residential Renovation Estimation Computations

1. Multiply the known square footage of new residential construction by the cost/square foot ($83).
2. Subtract this estimated cost of new construction from the combined cost of new construction and renovation.
3. Divide the resulting estimated cost of renovation by the cost per square foot to renovate ($70).
4. Result: Estimated square feet renovated.

NOTE: The value of construction and renovation is presented in constant 1996 dollars.

Attachment 2

Commercial Renovation Estimation Computations

Commercial Renovation Estimation Computations

1. From the 1999 Department of Energy's Energy Information Administration's 1999 Commercial Buildings Energy Consumption Survey, data were obtained regarding total commercial floor space by type of industry in the Northeast Region.

2. The numbers of employees for each of these categories employed in the Northeast Region and in New York City (City) were obtained from the Bureau of Labor Statistics, Current Employment Statistics Survey.

3. From these data, the square feet of commercial space occupied by different types of employees in the Northeast Region was computed.

4. The computed square feet of space per employee was then applied to the City employment figures to estimate commercial square footage by type of industry.

NOTE:

These data series are displayed in Table 4.2-2. The City's service employees (these data exclude producers of goods) are about 48% employed in the Office category. For the Northeast region, a slightly smaller percentage of employees, 45%, are employed in this category. The Northeast has 25% of its workers in transportation, trade and utilities, compared to just 16% for the City. Though the percentage representation of each of these industries in the employment base may differ between the region and the City, one may assume that the square feet occupied by each employee in different industries would be comparable between the region and the City. There is a significant difference in the space occupied by employees is different industries. For example, transportation, trade and utility workers each occupy an average of 672 square feet whereas office workers occupy just 280 square feet each. Using the actual employment figures for the City and the average square footage occupied by each employee in the four different industry groupings, the estimated commercial square footage for the City was computed.

Attachment 3

Weighted Average Densities, Non-Putrescible Waste

Weighted Average Densities, Non-Putrescible Waste

Item	Year 2000 Tons	Percent of Total	Density	Weighted Average Pounds
Residential				
Construction	31,952	1.70%	342	6
Demolition	467,262	24.90%	552	137
Renovation	37,353	2.00%	345	9
Commercial				
Construction	24,149	1.29%	549	7
Demolition	709,347	37.80%	711	269
Renovation	606,425	32.3%	469	152
Total Building-Related C&D	1,876,488	100.00%		580
Non-Building Related C&D			825	825

See Table A-2 for the density figures and their sources. Tonnages derived from various tables in text.