New York City Department of Sanitation

Commercial Waste Zones

Appendix

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ACRONYMS AND ABBREVIATIONS

BART	Best Available Retrofit Technology
BIC	New York City Business Integrity Commission
BID	Business Improvement District
C&D	Construction and Demolition Debris
CWZ	Commercial Waste Zones
CWZAB	Commercial Waste Zones Advisory Board
DSNY	The New York City Department of Sanitation
LL	Local Law
NO_x	Nitrogen Oxides
NYC	New York City
NYCDCA	NYC Department of Consumer Affairs
NYCDCAS	NYC Department of Citywide Administrative Services
NYCDEP	NYC Department of Environmental Protection
NYCDOT	NYC Department of Transportation
NYS	New York State
NYSDEC	NYS Department of Environmental Conservation
NYSDMV	NYS Department of Motor Vehicles
NYSDOT	New York State Department of Transportation
OneNYC	*One New York: The Plan for a Strong and Just City*
PM	Particulate Matter
SWMP	Solid Waste Management Plan
The City	New York City
TWC	Trade Waste Commission
USDOT	US Department of Transportation
VMT	Vehicles Miles Traveled

Appendix A

The Existing Commercial Waste System

APPENDIX A – THE EXISTING COMMERCIAL WASTE SYSTEM

Introduction

Waste management is one of the lifelines of New York City (NYC). Proper and effective waste management has kept the city functioning and clean since the sweeping reforms to the Department of Street Cleaning (now the Department of Sanitation, or DSNY) in 1895. As the city's relationship to waste has evolved over time, so have its objectives in terms of safety, health, and environmental impact. The city's current waste management arrangements allow residential and institutional waste to be primarily collected by DSNY, while commercial waste is primarily collected by private waste haulers, or carters. As part of the City's vision to improve sustainability and reduce environmental impact, it has committed to instituting commercial waste zones (CWZ) as a method of advancing zero waste goals, reducing vehicle miles traveled (VMT), and creating improved industry operational and safety standards. In order to properly implement CWZ, a clear understanding of how the commercial waste industry became what it is today and what factors shape its operations is required. To that end, the project team reviewed prior studies on commercial waste in NYC and summarized regulations applicable to commercial vendors and the private waste industry. This appendix describes the history of commercial waste collection and regulation.

History of Commercial Waste in NYC

The New York City Department of Sanitation

In 1881, New York City created the Department of Street Cleaning in response to the large volume of garbage coating the streets. Vast improvements in the management of city waste occurred in the mid-1890s led by Commissioner Colonel George Waring. The Department of Street Cleaning later became DSNY in 1929.

For the first half of the 20th century, DSNY collected commercial, residential, and institutional waste. In the late 1950s, responsibility for the collection of commercial waste shifted to private carters. In 1989, the City passed Local Law (LL) 19, mandating recycling for residents, businesses, and institutions.

The New York City Business Integrity Commission

Following the bifurcation of residential and commercial waste collection in the 1950's and up until the mid-1990's, the commercial waste carting industry operated as a cartel that was plagued by corruption and controlled by organized crime. Under the "property rights system," which was enforced by organized crime, carters did not compete for their customers and compelled customers to enter into long-term contracts with onerous terms. Along with rampant overcharging and other scams, prices were kept artificially high. The corruption within the industry resulted in numerous crimes and wrongful acts, including physical violence, threats of violence, and property damage to both customers and competing carting firms. In response, the City passed LL 42 of 1996 to create the Trade Waste Commission (TWC). The TWC was later combined with the Markets Division at the Department of Small Business Services and the Gambling Commission and renamed the Organized Crime Control Commission in 2001. The Organized Crime Control Commission's name was then changed to the Business Integrity Commission (BIC) in 2002 but is still referred to as the Trade Waste Commission in the NYC Administrative Code. BIC has been responsible for removing criminal influences from the private trade waste industry and ensuring that those forces never return. BIC performs background investigations, issues licenses and registrations, and sets maximum rates that customers can be charged for collection of putrescible waste and recyclables.

Current Commercial Waste System

Commercial Waste Carters

A BIC-issued license is required to legally remove waste from commercial establishments within NYC. Every private carter in NYC must apply for and obtain a license from BIC to remove, collect, or dispose of trade waste. The license application requires applicants to submit to a criminal background check; disclose names of principals and employees; submit company and personal financial information; disclose criminal, civil, and administrative violations; disclose associations with organized crime figures; and provide information about the vehicles used in the course of the applicant's business. After BIC grants a license, the licensee is required to regularly report data to BIC, including customer information and financial statements. Licensed carters are also obligated to answer inquiries and respond to demands for records and information whenever BIC determines that such a demand is necessary. Private carters that solely remove construction and demolition debris (C&D) are exempt from the trade waste licensing requirement but must still register with BIC. Currently, approximately 90 licensed-carters actively provide putrescible waste and recycling collection and disposal services within NYC.

BIC is responsible for setting the rate cap, which is the maximum rate that carters can charge for the removal of certain types of putrescible waste and recycling. Customers cannot be charged above the rate cap, but they can negotiate a price below it. The cap allows for charges by weight and by volume of waste. Customers have the right to choose by which method they are charged. As of August 9, 2018, the rate cap was adjusted to $20.76 per cubic yard of loose refuse (volume) or $13.62 per 100 pounds of refuse (weight). This adjustment reflects a 10 percent increase from the previous rate cap to account for rising operational costs, investments necessary to comply with vehicle emissions laws, and changes to the organics and recycling regulations.

Under present regulations, private carters may have either oral or written service agreements with their customers. Of 118,000 service agreements reported by carters to BIC in 2016, more than half were oral agreements without a corresponding written or signed agreement. An oral service agreement can be terminated by a customer at any time and by a carter with 14 days written notice. Written service agreements containing no provision regarding duration can be terminated by a customer at any time and by a carter with 14 days written notice. Service agreements, both oral and written, cannot exceed two years in duration. Carters must also still provide written bills, statements, or invoices on at least a monthly basis to every customer that the carter services regardless of service agreement type.

Commercial waste carters must abide by BIC requirements for carter operations in order to retain their licenses or registrations to operate and avoid other administrative penalties. An overview of BIC regulations include:

- Following DSNY commercial recycling collection separation requirements per BIC and DSNY definitions
- Providing decal(s) to customers clearly stating the carter-identifying information, contact information, and type of collection service
- Charging at or below the maximum set rate, established by BIC, for the removal of trade waste categories
- Keeping proper customer, employee, and financial records and other information important for reporting purposes
- Following service agreements, both oral and written
- Staying out of associations that may be taking part in criminal activity
- Maintaining proper license plates and clear identifying markings on carter vehicles
- Properly labeling containers provided by the carter
- Complying with any additional regulations and requests applicable to the carter from Federal, State, and local governmental authorities

Commercial waste generators may register as self-haulers with BIC for the transport of waste generated by their own commercial business. In 2017, there were roughly 650 active registered self-haulers in NYC. They are subject to some of the same regulations as commercial trade waste licensees, including recycling separation requirements, display of

registrations for self-hauling and organic waste self-hauling, upkeep of proper license plates and labelling of trucks, and additional applicable laws from regulatory authorities.

Commercial Waste Vehicles

For any truck carrying waste in NYC, BIC provides rules for truck specifications, classification of truck types, labelling of trucks, capacity and weighing requirements, and rules of operations. All vehicles must be clearly labeled with information including the carting company's name, vehicle weight, and allowed capacity in weight and volume. To prevent confusion with DSNY waste trucks, trucks cannot be white, beige, or a similar color. Many rules apply for truck operations, intended to prevent the release of waste contents and excessive odors and to ensure safe and sanitary practices. Inability to comply with these rules can lead to impoundment of vehicles or fines.

All vehicles, including commercial waste trucks, must abide by New York State (NYS) vehicle and traffic laws and related regulations promulgated by the NYC Department of Transportation (NYCDOT), NYS Department of Transportation (NYSDOT), NYS Department of Motor Vehicles (NYSDMV), and US Department of Transportation (USDOT). These include, but are not limited to:

- Size of vehicles permitted on the road
- Restrictions on vehicle idling and parking
- Requirements to use designated truck routes
- Speed restrictions, rights of way, turns, traffic signals, and other movement restrictions
- Avoiding behavior that would endanger people or property

As part of a larger strategy to reduce emissions from heavy-duty truck fleets, New York City first aimed at cutting the emissions of its public-sector collection trucks. DSNY's 2,100 truck fleet now runs on computer-controlled, clean-diesel engines, and ultra-low sulfur diesel fuel. In September 2013, M.J. Bradley & Associates, LLC published a study for BIC and the Environmental Defense Fund on the environmental impact of phasing out older diesel commercial waste trucks in NYC that were manufactured before select cut-off dates. The study showed that the best reduction in particulate matter (PM) and nitrogen oxides (NO_x) emissions, two of the major pollutants from burning diesel fuel, would be achieved if NYC retired all pre-2007 diesel trucks by 2020. In response to the report, the New York City Council passed LL 145 of 2013, otherwise known as the Heavy-Duty Trade Waste Hauling Vehicle Emission Law. This law requires that all BIC licensees and registrants install Best Available Retrofit Technology (BART) or EPA-certified 2007 engines in all heavy-duty commercial waste hauling vehicles by January 1, 2020. If carters do not comply, both NYC Department of Environmental Protection (NYCDEP) and BIC have the authority to issue notices of violation with an order to correct the violation within 60 days. If the violation is not cured within 60 days, the licensee or registrant will be liable for a civil penalty of $10,000 per vehicle found to be in violation of the law. An additional penalty of up to $500 per day may also be imposed for each day the violation is not corrected beyond 60 days of when the "order to correct" was issued. Beginning on January 1, 2019, BIC may refuse to issue licenses and registrations to any carter failing to demonstrate the ability to comply with LL 145 unless the carter has been granted a waiver for financial hardship or has a financial hardship waiver application pending with BIC. Any waivers granted will expire by January 1, 2025, if not sooner.

In 2016 and 2017, the New York City putrescible waste and recycling collection fleet consisted of roughly 1,100 commercial waste trucks operated by approximately 90 actively reporting companies. The average age of those trucks was 12 years.

In addition to legislating emissions improvements, the New York City Council passed LL 56 of 2015, requiring commercial waste vehicles (among other large vehicles) with a gross vehicle weight rating greater than ten thousand pounds to be equipped with appropriate side guards by January 1, 2024. In 2017, BIC, NYC Department of Citywide Administrative Services (NYCDCAS), and NYCDOT partnered to offer the Vision Zero Side Guard Incentive Program to subsidize the early installation of side guards on trucks covered by LL 56 with 2007 or newer model year engines on a first-come first-serve basis. The program covers either 50% or up to $2,000 for each truck's side guard installations, whichever is less. Failure to

comply with LL 56 can result in civil penalties of $10,000 per vehicle plus additional fines of $500 per day if not corrected within 30 days of an order to correct.

Garages, Transfer Stations, and Recycling Facilities

In New York City, commercial waste truck activity is particularly concentrated at private transfer stations and garages (or yards). Trucks go out to collect waste and bring the waste to private transfer stations. The process repeats until trucks return to the garage at the end of a shift.

At private transfer stations, waste is packaged for transport in long-haul trucks or rail out of the city. Transfer stations are located in M1-M3 zoning districts. M1 districts are light manufacturing districts with some residential areas, while M3 districts are heavy manufacturing districts where no new residences or community facilities are permitted to be built. Waste trucks traveling to and from these transfer stations often pass through residential communities. The impact of waste transfer stations on surrounding communities has continuously been a topic of discussion in NYC, and efforts to improve the quality of life for residents around transfer stations is a major goal highlighted in the City's Solid Waste Management Plan (SWMP). Waste transfer stations in NYC are regulated primarily by DSNY and NYS Department of Environmental Conservation (NYSDEC), and garages are mainly regulated by the NYC Department of Consumer Affairs (NYCDCA).

In August 2018, Mayor de Blasio signed LL 152, also known as the Waste Equity Law, to limit the amount of waste that comes to transfer stations in three neighborhoods overburdened with waste management infrastructure. This law reduces the amount of waste that private transfer stations can accept in North Brooklyn by 50 percent and in the South Bronx and Southeast Queens by 33 percent. The law contains exemptions for capacity to process recyclables and organic waste and for facilities that export waste by rail or barge. It also prohibits the creation of new transfer stations in neighborhoods that handle at least 10 percent of the city's waste. The capacity reductions will take effect at each transfer station's annual permit renewal beginning October 1, 2019.

Appendix B

Prior NYC Commercial Waste Studies

APPENDIX B – PRIOR NYC COMMERCIAL WASTE STUDIES

New York City Waste Composition Study, 1992

New York City Waste Composition Study (1992)
Year of Data: 1989-1990
Disposal (tons/year): N/A
Diversion: N/A
Generation (tons/year): 3,864,980
Data Sources: Direct Measurements

The 1992 New York City Waste Composition Study was conducted by SCS Engineers and was the last large-scale direct measurement study of waste composition in NYC to include commercial waste as a separate category. Data collection occurred between 1989 and1990.

Over 750,000 pounds of waste were sampled from 23 residential communities in four boroughs, 40 private and municipal institutions, and over 200 private businesses over the course of four seasons. The waste was sorted into 10 categories and 51 subcategories by weight. In addition, the study included a chemical analysis and compaction testing of the waste to determine chemical makeup and density.

Commercial Waste Generation Estimates

The business subsectors covered in the study account for about 80 percent of the entire commercial activity in the City. Total waste generation was estimated at 3,864,980 tons per year for the five boroughs. The most significant contributions to the waste stream were paper and organics.

Commercial Waste Management Study, 2004

In 2000, the City enacted LL 74, which required DSNY to conduct a comprehensive assessment of commercial solid waste management in NYC. As part of this assessment, DSNY reviewed waste flows, privately-owned transfer stations, and waste trucks to determine the current state of the industry and whether any gaps in regulation needed to be resolved. The Commercial Waste Management Study was published in 2004 and findings from this study helped to inform DSNY's 2006 SWMP.

Commercial Waste Generation Estimations

Data was acquired from DSNY's quarterly transfer station tonnage reports, surveys to carters and out-of-City transfer stations, interviews, and employment statistics. At the time, 124 licensed reporting carters were collecting the city's commercial putrescible waste.

Commercial Waste Management Study (2004)		
Year of Data: 2002	Year of Data: 2002	Year of Data: 2003
Disposal (tons/year): 2,272,958	Disposal (tons/year): 2,253,380	Disposal (tons/year): 2,261,355
Diversion: 31%	Diversion: 30%	Diversion: 27%
Generation (tons/year): 3,295,677	Generation (tons/year): 3,240,250	Generation (tons/year): 3,085,000
Data Sources: Carter surveys, industry interviews	Data Sources: Employment-based estimates	Data Sources: Carter surveys, carter interviews, transfer station tonnage reports

Transfer Stations

The study made recommendations for transfer stations to neutralize odors, reduce emissions of regulated pollutants, control dust, change permitting requirements to reduce off-site truck queuing, and shift to a computerized system for inspection forms to improve enforcement and coordination of regulating agencies.

Waste Disposal Capacity Available

The study found that enough mega-landfills with capacity greater than 1,000 tons per day exist in the mid-Atlantic, Southeast, and Midwest to meet the needs of DSNY and private carter managed waste in NYC. Most of these sites are located more than 400 miles from the City, and thus rail and barge were suggested solutions for long-distance transport over the primary practice of long-haul trucks.

Waste Vehicle Technology

Several clean diesel, natural gas, and other fuels were reviewed to determine comparative characteristics, costs, and emissions to stay ahead of ever-stricter emissions regulations. For private waste carters, the study recommended retrofitting old diesel vehicles with clean diesel technology, purchasing clean diesel vehicles, using ultra-low sulfur diesel, using government grants and economic incentives to offset costs, and exploring the option of natural gas-based heavy-duty refuse vehicles.

DSNY Solid Waste Management Plan, 2006

The DSNY SWMP created a 20-year framework for the City's waste management. Many of the plan's elements, including reduction of truck traffic in areas surrounding waste transfer stations, are a result of environmental justice advocacy for affected communities. The plan keeps in mind the environmental impact of both the residential and commercial portions of the City's waste management practices. Policies pursued in the SWMP are backed with data from the 2004 Commercial Waste Management Study.

The 2006 SWMP addresses recycling and waste prevention efforts, prioritizing new waste transfer stations using barge or rail for waste export, reducing impacts to communities by waste transfer stations, and improving fleet environmental performance. The SWMP also addresses alternative waste disposal technologies and the city waste stream composition.

Transfer Stations

In 2006, there were 54 waste transfer stations (18 putrescible, 22 non-putrescible, and 20 fill material permits). Five of these facilities had dual-permits, one facility had three permits, and two were intermodal facilities. Since the 2006 count, the total number of transfer station permits has remained roughly the same. These stations have enough capacity to handle both the commercial and residential waste that passes through.

New York City Commercial Solid Waste Study and Analysis, 2012

New York City Commercial Solid Waste Study and Analysis (2012)
Year of Data: 2009
Disposal (tons/year): 2,583,000
Diversion: 26%
Generation (tons/year): 3,490,000
Data Sources: Employment-based estimates, transfer station tonnage reports

The New York City Commercial Solid Waste Study and Analysis was completed by Halcrow, Inc. in 2012. It touches on commercial vendor and private carter knowledge and behavior, commercial waste flow, waste estimations, and truck traffic.

This study was intended to review commercial waste recycling practices, potential for additional recovery of recyclables, and flows of commercial putrescible waste. The study analyzed commercial generator knowledge and behavior, carter collection behavior, commercial waste quantities and composition, and waste truck traffic. Teams surveyed commercial waste generators, conducted night-time observations of pickups and streets, and reviewed datasets provided by DSNY, BIC, and other entities in NYC.

Commercial Waste Quantity Estimates

Commercial waste quantity generation, diversion, and disposal rates were estimated using an “Employee-based Disposal Model” and transfer station tonnage reports provided by DSNY and NYSDEC. Per-employee waste disposal factors were taken from a literature review of five previous commercial waste studies from California and Canada and applied to businesses in NYC to estimate disposal rates. A diversion rate of 26% was calculated from the transfer station tonnage report data. Lastly, the diversion rate and disposal rate were used to calculate the total annual commercial waste generation.

Commercial Waste Generator Knowledge and Behavior

The survey included commercial waste generators dispersed throughout the five boroughs and covering 23 business types. Eighty-two percent of interviewees reported that they recycled. However, almost half of interviewees thought residential and commercial recycling rules were identical. Many businesses recycled items that were not required. Cardboard was the most popular item to recycle, with 73 percent of businesses doing so. Less than half of all businesses recycled items such as paper, plastic and glass bottles, and cans. Few businesses provided bins or signage for employees or customers explaining where or how to recycle. The most common sources of information to businesses regarding recycling requirements were private carters, DSNY, and building management/corporate policies.

Waste Traffic Analysis

The waste traffic analysis was based on data from 138,000 commercial customers from the BIC customer register database. The study revealed that the analyzed carters travelled almost 100,000 miles per day in total. A route’s VMT was dependent upon the distance between customer locations (i.e. density of the customer base) and the movement of the truck from the garage to the first customer and from the last customer to the transfer station. Carters picking up roll-on roll-off containers (ro-ros) serviced one customer, took the waste to a transfer station, and returned the empty ro-ro back to the customer. This resulted in increased vehicle hours travelled for each pickup for such containers.

New York City Commercial Refuse Truck Age-out Analysis, 2013

In 2013, BIC and the Environmental Defense Fund led the NYC Commercial Refuse Truck Age-out Analysis, performed by M.J. Bradley & Associates, LLC. This study provided calculations that supported the passing of LL 145 of 2013, otherwise known as the Heavy Duty Trade Waste Hauling Vehicle Emission Law.

The costs and air quality benefits of setting age-out provisions were analyzed for private carter waste trucks. Under the following five scenarios, the impacted NO_x and PM emissions were calculated for each year between 2013 and 2030:

Option 1) Retire all pre-1994 trucks by 2016
Option 2) Retire all pre-2007 trucks by 2020
Option 3) Retire all pre-2007 trucks by 2025
Option 4) Retire all pre-1994 trucks by 2016 and retire all pre-2007 trucks by 2025
Option 5) Retire all pre-2007 trucks by 2030

Existing NYC Commercial Refuse Truck Fleet

The study reviewed trucks for putrescible waste and recyclables collection, as well as for C&D waste collection. All trucks analyzed weighed greater than 16,000 lbs. The average age was 16 years for both subsets of trucks. Only 10 percent of the putrescible waste and recycling truck fleet was a 2007 or newer model. The natural turnover for new trucks between 2007 and 2013 was estimated at one to two percent per year, meaning that if no action was taken, only one-third of trucks would be 2007 or newer models by 2020.

Effect of Replacing Pre-2007 Vehicles by 2020

Waste hauling trucks with 2007 or newer model engines produce 98 percent less PM than 1995 models, and trucks with 2010 or newer engines produce 96 percent less NO_x than 1991 models. Due to the drastic improvements in emissions controls technologies, the study determined that retiring all pre-2007 trucks by 2020 would result in the greatest emissions reductions over all other options. The cost of compliance to the industry could be reduced through replacing only truck engines or through using BART rather than fully replacing the vehicle.

Private Carting Study, 2016

In 2015, the Mayor's Office released *One New York: The Plan for a Strong and Just City* (OneNYC). As part of OneNYC, the City decided to conduct a comprehensive study of CWZ. This Private Carting Study showed that implementing CWZ would significantly reduce truck traffic and air emissions with the opportunity to introduce other benefits such as improved industry-wide health and safety standards and more uniform commercial recycling practices.

The Private Carting Study reviewed the state of the commercial waste market in terms of size, companies, costs for collection, trends, and the impact of commercial waste zones with references to other cities that have implemented CWZ. It looked at routing data for waste trucks to determine the impact of CWZ versus the current state of affairs and route optimization without CWZ. Based on the waste truck traffic analysis, air emissions reductions calculations were conducted for greenhouse gases and criteria pollutants.

Market and Cost Analysis

BuroHappold conducted the market and cost analysis using data from carters via the 2014 BIC Customer Register, 2013 financial statements, and interviews. The data showed that the top ten carters held 69 percent of customer accounts. Large carters cover a wide geographic area, but almost 40 percent of small carters also serve three or more boroughs. Carters serve a diverse customer base, with 80 percent of carters providing both putrescible and recycling services and 70 percent of carters serving more than five customer types. Relationships between carters and customers tend to be direct (without brokers), informal (oral contracts), and can change often.

Routing and Air Quality Analysis

The routing analysis was conducted by Sam Schwartz Engineering and the air quality analysis was conducted by Paul Carpenter Associates. The routing analysis focused on the 90 carters that collect putrescible and/or recyclable waste servicing roughly 108,000 customers. The study divided NYC into 11 hypothetical zones. It found that private waste trucks travel over 23.1 million miles per year (63,300 miles per day) and that implementation of CWZ could decrease VMT by 49 to 68 percent. Every neighborhood would see a reduction in truck traffic which would result in improvements in air quality, traffic safety, roadway maintenance costs, traffic congestion, and night-time noise. A reduction of 42 to 64 percent in greenhouse gas emissions and 34 to 62 percent in criteria air pollutants was expected.

Appendix C

Waste Systems in Other Municipalities

APPENDIX C – WASTE SYSTEMS IN OTHER MUNICIPALITIES

Throughout the country, municipal and county governments have adopted various arrangements for commercial waste management, depending on local program goals and geographic constraints. During the CWZ planning process, DSNY considered more than 70 of the nation's largest municipalities and counties and completed 21 case studies to help inform the design of a CWZ system that meets the unique needs and conditions of New York City.

Nationwide research shows that a zone system, where carters' operations and routes are constrained within geographic boundaries, is necessary to manage the number of vehicles on the road and VMT by solid waste vehicles. Zone systems result in collection efficiencies due to increased customer density. Among the case studies, the types of commercial collection programs and geographic zone boundaries varied significantly. Across the nation, private carters operate within a variety of regulatory structures, such as exclusive or nonexclusive zone systems, license/permit programs, or open market systems. An exclusive or nonexclusive zone system may also be constrained by customer types and/or waste types in addition to geographic area. Geographic area constraints range from citywide, most commonly in smaller municipalities, to 10 or more zones. Hybrids of exclusive and nonexclusive zone systems, known as limited exclusive zone systems, also exist in a variety of forms. One example is Hillsborough County, FL, where residential waste is collected in five exclusive zones. The carters that hold residential zone contracts are able to compete with one another across the county for commercial waste customers, in a nonexclusive environment.

The various systems also differed in the contract requirements for private carters related to customer experience, quality of service, environmental impacts, diversion, safety, administration, enforcement, economic efficiencies, and service rates. The versatility in the application and implementation of these requirements is virtually unlimited; CWZ is a flexible tool that can be tailored to further whatever goal a municipality has for its waste management system. A clear understanding of a community's goals and objectives is critical to developing the best structure for that community.

In all cases of the implementation of a new system, the execution of a detailed transition plan was essential to mitigate service disruptions and sustain a program. Timing and length of transition are also important factors for a successful transition. For example, San Jose, CA alerted service providers five years prior to changing the commercial collection system and began an extensive campaign four years prior to promote stakeholder involvement. The transition time also provided the new carters an opportunity to enter into contracts with some of the previous service providers to buy-out equipment and employ personnel.

Municipalities and counties approached the accommodation or consolidation of smaller to mid-sized service providers that do not win service contracts in several ways. This included having different regulatory structures for different generator types, (e.g., residential or commercial customers) and material types (e.g., putrescible waste, recyclables, organics, or C&D debris). The California jurisdictions of Los Angeles, Sacramento, and Santa Barbara County all observed incoming awarded carters acquiring smaller carters, or hiring employees from smaller carters, who had previously provided collection services in the service zones.

Other lessons learned that are most relevant to NYC's development of a commercial waste zone system include:

- As collection operations become more efficient, system-wide collection costs decrease.
- Adequate funding for program administration and enforcement is a critical element to the success of a program.
- Rate transparency occurs when local market rates are available to all customers.

The municipalities used for case studies include:

Exclusive Zone Systems:

- City of Fresno, California
- City of Las Vegas, Nevada
- City of Los Angeles, California
- City of San Jose, California
- City of Seattle, Washington
- City of Oakland, California
- Palm Beach County, Florida
- Santa Barbara County, California

Nonexclusive Zone Systems:

- City of Long Beach, California
- City of Sacramento, California
- City of San Diego, California

Limited Exclusive Zone System:

- Hillsborough County, Florida

License / Permit Program:

- City of Austin, Texas
- City of Boston, Massachusetts
- City of Fort Worth, Texas
- City of Minneapolis, Minnesota
- City of Philadelphia, Pennsylvania
- City of Portland, Oregon
- Town of Hempstead, New York

Open Market:

- City of Chicago, Illinois
- City of Phoenix, Arizona

Appendix D

Stakeholder Engagement

APPENDIX D – STAKEHOLDER ENGAGEMENT

Stakeholder input and feedback are core necessities for the implementation of a successful CWZ program. Stakeholders informed the zone design process and the goals of the overall NYC CWZ program. The organizations identified during the stakeholder outreach process included carters, waste industry associations, business associations, commercial property owners, environmental advocacy groups, labor unions, Business Improvement Districts (BIDs), and political representatives.

This appendix illustrates the stakeholder outreach and engagement process for CWZ implementation planning. The program has been successful in engaging a large variety of stakeholders. Engagement efforts were conducted in a variety of settings to provide breadth of feedback, and the program has a dedicated Commercial Waste Zone Advisory Board (CWZAB) with representatives from each identified stakeholder group that provides valuable continuous feedback on stakeholder needs.

Stakeholder Outreach

In an initial round of stakeholder outreach, more than 100 unique stakeholders were engaged in a variety of formats including: structured one-on-one interviews, small group conversations, phone calls, field interviews, and focus groups. These engagements were designed to solicit baseline impressions of CWZ, gather feedback to inform zone design, and better understand the operational needs of carters and NYC businesses. Additionally, these conversations served as a vehicle to inform key stakeholders about the high-level elements of the CWZ process, including the project timeline, preliminary results of analysis and design, and development of program goals and strategies.

Stakeholder Engagement Process

DSNY began the initial phase of stakeholder engagement by interviewing the members of the CWZAB to better understand each organization's perspective and opinions regarding a zoned commercial waste system. These interviews culminated in a CWZAB meeting in October 2017. This provided CWZAB members an update directly from key DSNY staff regarding what decisions had been made to date, how data would be utilized, how initial zone design candidates would be created, and how feedback would be solicited throughout the process.

Building off conversations with CWZAB members, subsequent stakeholder engagement solicited viewpoints from a diverse array of New Yorkers that could be affected by the proposed changes to the commercial waste collection process. The additional stakeholders included small commercial waste carters, small and large businesses, and large commercial property owners. DSNY maintained a specific focus on reaching stakeholders in every borough and in communities of varied sizes, typologies, and densities. Stakeholders were asked about their current experience with commercial waste, as well as their opinions of CWZ and its potential impact on them. Stakeholder groups have been updated throughout the CWZ design process.

Stakeholders engaged during this initial phase include:

- Carters: Action Carting, Avid Waste, Basin Hauling, Century Waste, C.J.S. Sanitation, Crown Container, D&D Carting, D. Daniels Sanitation, Filco Carting, Five Star Carting, Industrial Carting, M&M Sanitation, Mr. T Carting, Quality Waste Services, Republic Services, Royal Waste Services, Tully Environmental, and Waste Connections
- Brokers: Recycle Track Systems and Rubicon Global
- Industry Associations and Other Waste-Related Organizations: National Waste and Recycling Association (NWRA), New Yorkers for Responsible Waste Management (NYRWM), the Solid Waste Association of North America (SWANA) and the Closed Loop Fund

- Business Improvement Districts: Chinatown Partnership, Downtown Alliance, Fordham Road BID, Jamaica Center BID, Lincoln Square BID, New York City BID Association, and Staten Island Economic Development Corporation (SIEDC)
- Building/Property Owners and Managers: Boston Properties, Building Owners and Managers Association (BOMA), CBRE, JPMorgan Chase, Real Estate Board of New York (REBNY), Rudin Management, and Vornado
- Business Representatives (including organizations representing businesses and small and large businesses): Association for a Better New York, Food Industry Alliance, Macy's, National Supermarket Association, New York City Hospitality Alliance, the New York Mets, New York State Restaurant Association, Partnership for New York City, and Walt Disney Corporation, as well as a number of small and large chain businesses
- Elected Officials: Councilmember Antonio Reynoso and Public Advocate Letitia James
- Advocacy Organizations: Alliance for a Greater New York (ALIGN), Natural Resources Defense Council (NRDC), New York Lawyers for the Public Interest (NYLPI), New York City Environmental Justice Alliance (NYC-EJA), and Transportation Alternatives
- Organized Labor: Teamster Local 813 and Laborers Local 108

Appendix E

Proposed Zone Development

APPENDIX E – PROPOSED ZONE DEVELOPMENT

A key element for achieving the CWZ program goals is the development of an effective system of geographic zones that contain carter operations. During the CWZ planning process, DSNY considered a number of different zone designs, with variations including number of carters per zone, types of zone boundaries, and the size of zones. While infinite zone design possibilities exist, DSNY narrowed down the potential zone designs based on various data-driven analyses and stakeholder feedback collected throughout the planning process. This appendix expands on the design process and methodologies that led to the City's proposed zone design.

Data Sources

The multiple data sources used for the zone design analysis and to inform other parts of the CWZ program development are listed below.

- Better Practice Guidelines for Waste Management and Recycling in Commercial and Industrial Facilities, 2012
- BIC Carter Financial Statements, 2013 and 2015
- BIC Customer Register, Q4 2016 - Q1 2018
- BIC LL 145 Compliance Plan Data, 2017 and Vehicle Identification Number Database, 2016
- BIC Routing Data, 2014-2015
- DSNY and BIC Private Carting Study, 2016
- DSNY Carter Inbound Outbound Tonnage Reports, 2014-2016
- DSNY Commercial Solid Waste Study and Analysis, 2012
- DSNY Commercial Waste Management Study, 2004
- DSNY New York City Waste Composition Study (1989-90), 1992
- DSNY Transfer Station, Recycling Facility, and Metal Scrap Processor Tonnage Reports, 2014-2017
- Hoovers Business Register of NYC Commercial Businesses, 2016-2017
- New York State Department of Labor Current Employment Estimates (CES), 1990-2017 and Quarterly Census of Employment and Wages (QCEW), 2000-2017
- US Census Bureau Business Statistics by Census Tract and Zip Code, 2015
- 2014 Generator-Based Characterization of Commercial Sector Disposal and Diversion in California, 2015

Vehicle Miles Traveled Baseline Methodology

VMT is a parameter that represents the number of miles that all trucks drive to collect and drop off waste each day. A single route begins at the garage or truck yard, continues to each customer for waste collection, then to the transfer station for waste disposal/removal, and ends back at the garage. All route distances are summed to calculate VMT. VMT is used as the primary measurement of the environmental impacts of the current system and can be calculated to understand the environmental benefits of creating a zoned system. A zoned system will reduce VMT, further resulting in reduced truck traffic, greenhouse gas emissions, noise, and improved safety and air quality.

A baseline analysis was performed to evaluate the current day VMT for 70 carters that service NYC and reported information to BIC in the 2014-2015 Routing Data. The routing data covers four separate weeks of service in late 2014 and early 2015 and accounts for service coverage of 96,000 customers.

The raw 2014-2015 Routing Data was cleaned to collect relevant information including dates, routes, carter names, carter BIC ID numbers, customer names, customer addresses, types of waste collected, garage locations, transfer station locations, and sequences for collection. Customer addresses were geocoded using Google Maps Geocoding API. Routes were sequenced from the garage to first customer, customer to customer, last customer to transfer station, and transfer station back to garage.

Vehicle Miles Traveled Calculation Methodology

Once the sequence orders for each route were determined, the VMT for the baseline scenario was calculated using Here Maps Truck API. This tool was utilized because it is a commercial leader in serving the freight and transportation logistics market, generates routes that avoid roads prohibiting trucks, and prioritizes fastest route time over distance.

Vehicle Miles Traveled Baseline Results

Data from the July and September weeks of routing data were used to determine the baseline VMT as these time periods contained no major holidays or weather events that altered collection patterns. The total VMT across these two typical weeks was averaged to determine the daily VMT. The analysis resulted in an average of approximately 79,000 miles driven per day by the 70 carters.

Table 1: Weekly and Daily Average Vehicle Miles Traveled (2014-2015 Routing Data)

Date Range	Daily Average Vehicle Miles Traveled
July 6-12, 2014	77,000
September 7-13, 2014	81,000
Overall Daily Average	**79,000**

The data shows a significant overlap of collection routes in New York City, with some city blocks having as many as 400 garbage trucks pass by in one day. The overlap in routes was initially identified in the City's 2016 Private Carting Study and has been reaffirmed through the current VMT baseline analysis. In March 2018, carters were required to report an additional week of routing data, including collection and disposal information. This data is currently being processed and will inform the environmental review process going forward.

Pickup Patterns

Customers indicated that they value carters that can provide service at a precise time specified by the customer. The 2014-2015 Routing Data was analyzed to determine the current pickup patterns in the City. Most waste pickups, 76.8%, occur overnight between 8:00 PM and 6:00 AM. Daytime pickups are between 6:00 AM and 8:00 PM and are 23.2% of all pickups. However, this pattern can change by borough. In Staten Island, for example, only 1% of pickups occur during the day. Nighttime pickups are further divided into three timeframe segments, early night (8:00pm – 10:00pm), containing 9.9% of pickups; midnight (10:00pm – 2:00am), containing 40.4% of pickups; and early morning (2:00am – 6:00am), containing 26.5% of pickups.

Table 2: Overall Pickup Timeframe Distribution

Pickup Timeframe	Timeframe Distribution	Percentage of Pickups
Daytime	**6:00 am – 8:00 pm**	**23.2**
Nighttime	**8:00 pm – 6:00 am**	**76.8**
Early Night	8:00 pm – 10:00 pm	9.9
Midnight	10:00 pm – 2:00 am	40.4
Early Morning	2:00 am – 6:00 am	26.5

Further analysis for the baseline scenario considered pickup patterns for different business types to determine if there were industry specific patterns (e.g., restaurants requiring later pickup than office buildings). Customers in the 2014-2015 Routing Data were matched with 98 business types using Google Places API. These business types were matched to NAICS industry sectors. This made it possible to determine pickup times by industry sector. The data shows that there is no clear differentiating pattern between pickup times for any industry sector.

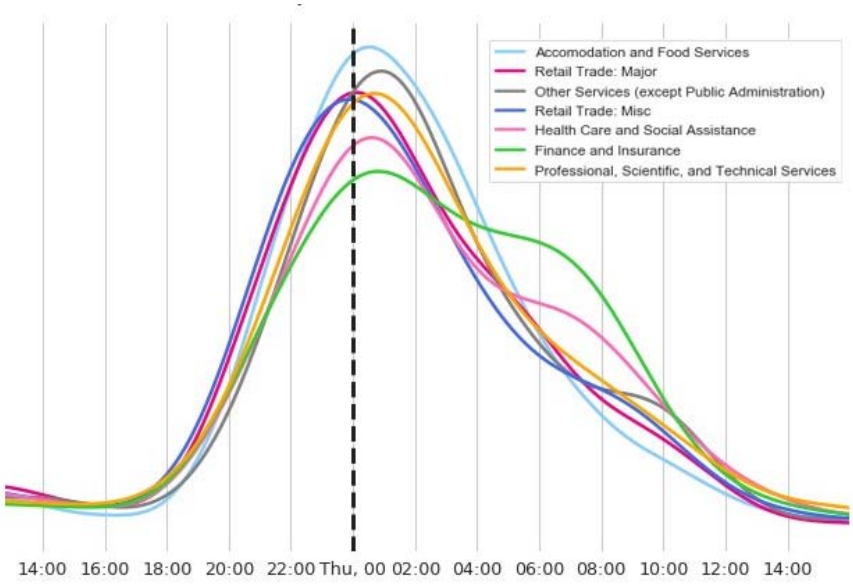


Figure 1: Pickup Pattern by Industry Sector Over Time

Vehicle Miles Traveled Simulated Methodology

One of the main goals of the CWZ system is to reduce VMT. The objective of the VMT simulation was to calculate the impact of potential zone designs on VMT reduction. Additional parameters were included in the simulation to reflect inefficiencies unique to commercial collection, as well as collection within a zoned system with a select number of carters. These parameters were pickup patterns and the number of carters operating in a zone, which results in routing inefficiency due to competition for customers.

The same cleaned version of the 2014-2015 Routing Data used in the baseline case was used for the customers in the VMT simulated case. In order to determine the new routes for the various zone design scenarios, several steps had to be taken to create the routes before calculating their associated VMT. These steps were as follows:

1) All customers not serviced by roll-on roll-off containers from the 2014-2015 Routing Data were divided based on geographic location into the corresponding zone for the zone design being evaluated.
2) Customers were divided into daytime and nighttime pickups based on their pickup time identified in the baseline case. (E.g., a customer that gets their waste picked up around 11pm in the baseline case is considered a nighttime pickup in the simulated case). Daytime and nighttime customers were treated as independent of one another.
3) Customers were then grouped into customer clusters based on customer location. This was done separately for daytime and nighttime customers. The clustering process includes random assignment of customers within a cluster to a hypothetical carter to simulate the impact of competition for customers.

a) For exclusive zones (one carter per zone), customers were grouped into clusters of approximately 123 customers per cluster. The median number of customers per route in the 2014-2015 Routing Data baseline case was 123 customers. All clusters in the zone are assigned to a single carter.

b) For nonexclusive zones with *N* number of carters (where *N* is greater than 1), customers were grouped into clusters with approximately 123**N* customers per cluster. (E.g., if 2 carters operated in a zone, then each cluster would include approximately 246 customers.) Within each customer cluster, customers were randomly assigned to one of the zone's hypothetical carters. It was assumed that carters within a hypothetical nonexclusive zone have equal market share.

4) Each carter's individual clusters were sequenced into routes. Daytime clusters were directly converted into sequenced routes. To further incorporate the impact of requested pickup times by customers, nighttime customers across a cluster were randomly divided in early night, midnight, and early morning service timeframes. In the sequencing simulation, customers within the early night segment are serviced, then the customers within the midnight segment, and then customers within the early morning segment. This sequencing simulates the behavior of carters going back and forth between areas within the course of a night to service customers with different pickup time needs.

5) Garages and transfer stations were randomly assigned to each route for multiple iterations. An average distance of all the iterations was used for the journey from garage to first customer, last customer to transfer station, and transfer station to garage.

a) The garage was assigned at random from the nearest ten garages of all carters to the centroid of the zone.

b) The transfer station was assigned at random proportional to transfer station usage rates seen in the baseline case.

Once the routes were defined, the route connections and VMT for each route were calculated using the same methodology used in the baseline case and described under Vehicle Miles Traveled Calculation Methodology. Note that roll-on roll-off container customers were not altered in the simulated routes. VMT by roll-on roll-off routes in the simulated scenario were set equivalent to the baseline scenario, as the distance for these routes will not be directly impacted by CWZ. Once the VMT was calculated for all routes, the individual VMT was summed to find the total VMT for the day.

First Stage Zone Design

Zone Boundary Types

When considering the shape of potential zones, two broad types of boundaries were considered – governmental and transportation infrastructure. Governmental boundaries include existing boundaries defining the entire city, boroughs, community districts, council districts, zip codes, and census tracts. Transportation infrastructure includes existing commonly-used roadways, among other infrastructure.

To achieve the goal of reducing commercial waste truck traffic, as well as for administrative purposes and management considerations, community districts were determined to be the most effective building blocks for zones. Access to major roads, tunnels, and bridges were used as a secondary metric to refine zone designs when choosing which community districts to cluster or split into single zones.

Figure 2: Basis for Zone Geographies, NYC Community Districts by District Number

Level of Exclusivity

In other jurisdictions, private solid waste collection service providers operate within a variety of regulatory structures, including exclusive or nonexclusive zone systems, license/permit programs, or open market systems. The CWZ system regulatory structures evaluated for NYC included:

- **Exclusive zones:** a system in which a jurisdiction grants a single service provider the exclusive right to provide collection services in a designated service area (zone).
- **Nonexclusive zones:** a system in which a jurisdiction grants a number of service providers the right to compete to provide collection services within a designated zone.
- **Material stream or generator type zones:** a system that specifies a material stream (e.g., food waste) or generator type (e.g., institutions) for which service providers are allowed to provide collection service. This could apply to either an exclusive or a nonexclusive zoned system.
- **Current market share zones:** a system that establishes exclusive zones that are designated and awarded to service providers currently operating within the jurisdiction based on their existing market share.

As the last two system types are variations on exclusive and nonexclusive systems, system types were simplified in the first level of screening to exclusive and nonexclusive zone systems for commercial generators.

Exclusive zone options would restrict each zone to one operating carter. Nonexclusive options would restrict each zone to two to five operating carters. Five carters was considered the upper limit for number of carters per zone due to the fact that truck route overlap increases as more carters operate in each zone and as the economic and operational benefits of a zone contract to a carter are reduced with each carter added to a zone.

Zone Sizing

Zone models varied by the number of zones and the size of each zone. In the first stage of zone design, models of 15, 20, 25, and 30 relatively equal size zones in terms of number of customers, as well as a model of 23 mixed sized zones were considered. In most cases, individual community districts were combined to form zones. To determine which community districts should be combined, a grouping methodology was used based on customer counts and data from existing routes. The grouping methodology ensured that community districts with the highest number of routes crossing between one another would be grouped together.

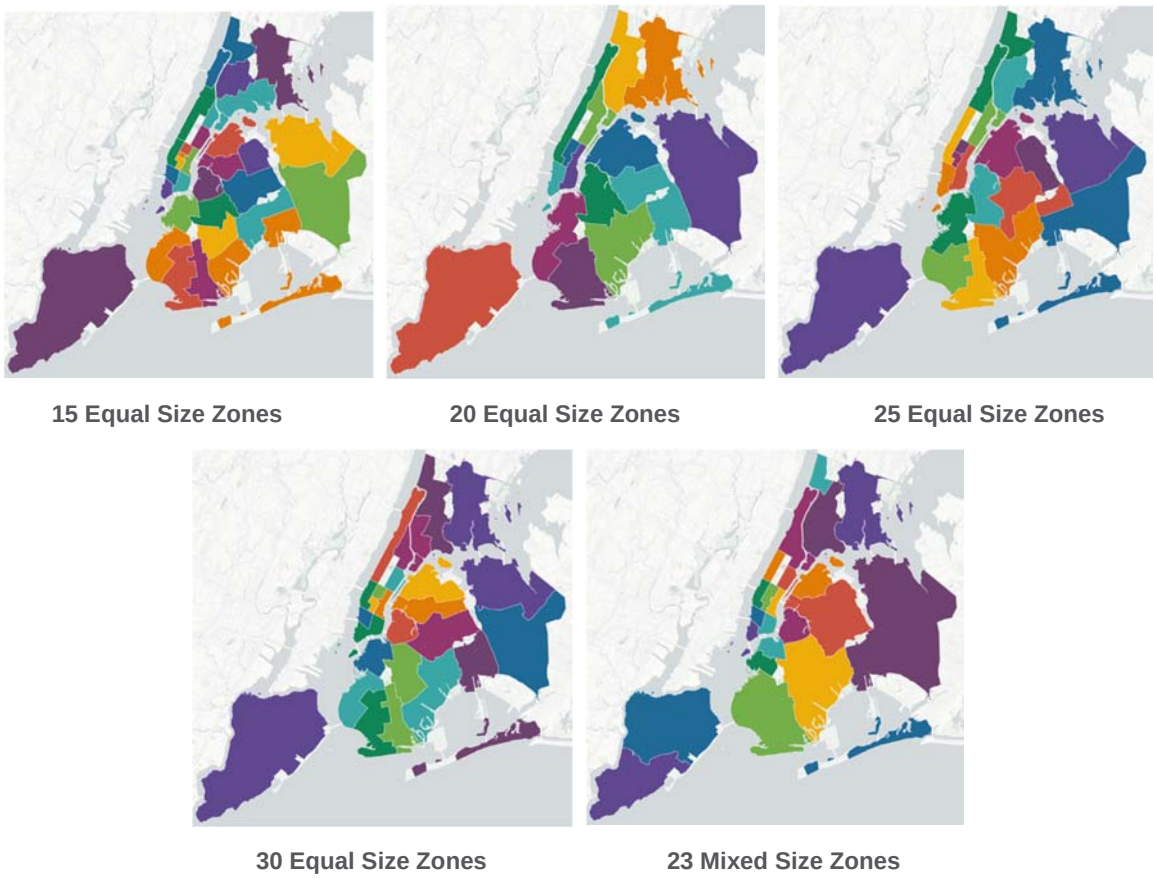


Figure 3: First Stage Zone Design Boundary Configurations

Zone Design Evaluation

The first zone design considerations for exclusive and nonexclusive models considered various levels of exclusivity (i.e., number of carters that should be included in each zone), types of boundaries (governmental and transportation-based), number of zones, and zone sizing. Options for each component were considered in multiple rounds of revisions to formulate the best reasonable range of zone design types.

The zone design options included combinations of 1, 2, or 5 carters per zone and 15, 20, 25, or 30 equal size zones or 23 mixed size zones. The zone design analysis also included two “extreme case” options, one in which each of the 59 community districts would be a separate exclusive zone, and one with five borough-based nonexclusive zones, with five carters operating within each zone.

Truck traffic reduction was a key parameter used to analyze and compare the different models. The analysis calculated the projected change in the number of miles that all trucks drive to collect and drop off waste each day, presently and as modeled in a zone system.

The act of constraining routes to a smaller geographic area and developing dense customer bases causes a substantial reduction in VMT; however, within the range of 15 to 30 zones, there was little variation in the degree of truck traffic reduction due to the number of zones or zone size. There was also little to no observed impact of having equal size versus mixed size

zones on truck traffic. The only exception was with the 5-borough nonexclusive extreme case. This likely occurs because the zone sizes are very large and there are inefficiencies with five carters operating per borough in such large areas.

Second Stage Zone Design

In the second stage of zone design, based on the findings of the first stage scenario comparisons, stakeholder feedback, and input from regulating bodies, four second stage zone design options were considered. All options were nonexclusive, as stakeholder feedback indicated this as a clear preference to exclusive zones. Based on the minimal tradeoff in truck traffic reduction between the exclusive and nonexclusive models, benefits to customers of retaining choice in their service provider, and the greater opportunity for smaller carters to be viable, only nonexclusive models were evaluated further.

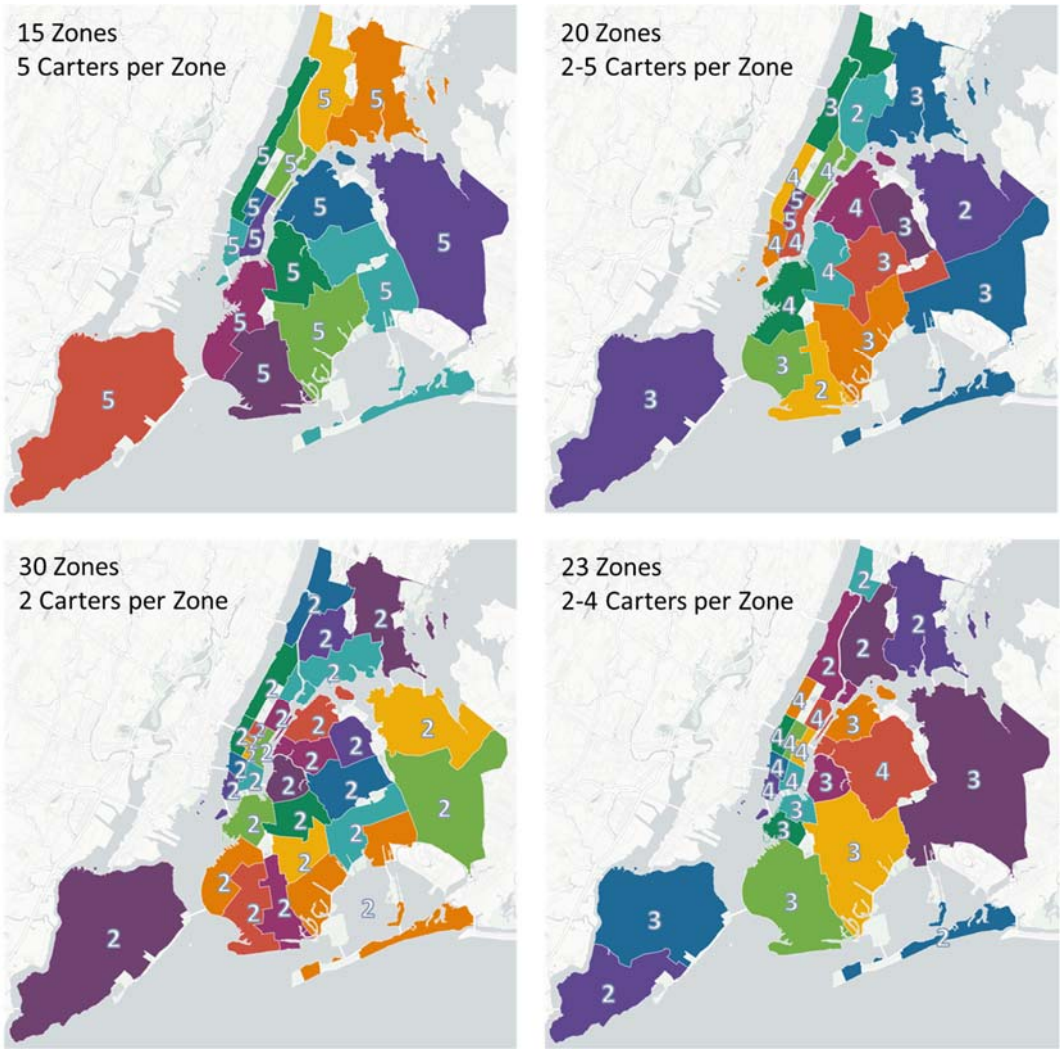


Figure 4: Second Stage Zone Design Options

Zone Design Evaluation

Second stage zone design options were compared using a stakeholder-orientated approach. Each option was considered based on its impact to businesses/customers, carters, the environment, and NYC regulatory agencies. Metrics important to

each stakeholder group were evaluated against each of the four options to narrow them down to the final, preferred zone design. Stakeholder feedback centered around the following for each group:

- Customers - price and service quality
- Carters - ability to continue to participate in the system
- Environment - positive environmental impact such as reduced air pollution and greenhouse gas emissions
- Regulating Agencies - zoned system must be practically manageable and simple to communicate

Finally, a 20-zone design scenario was determined to be the most effective zone design scenario.

Final Zone Design

The final zone design is slightly altered from the second stage 20-zone model. Zone boundaries were adjusted to stay within borough boundaries and higher carter caps were assigned to zones with greater commercial waste density. The minimum carter cap was set to three carters per zone to maintain a higher baseline of competition within each zone and more options for a variety of carters to be competitive. The design will result in a calculated 29,000 miles traveled per day, translating to a 63 percent reduction in truck traffic from current conditions. This is equivalent to removing 18 million miles of heavy-duty truck traffic from the city's streets every year, providing a healthier, safer, and cleaner New York City.

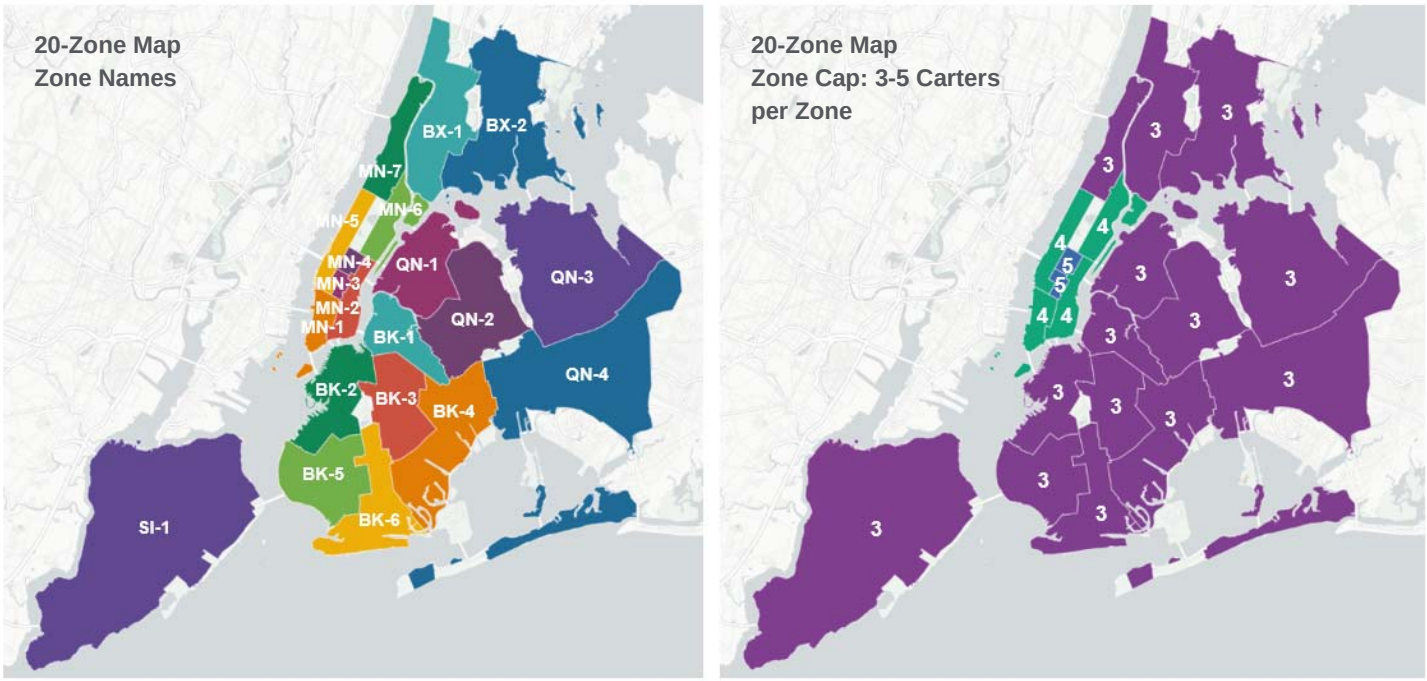


Figure 5: Final 20-Zone Map (including identifying number of carters operating per zone)

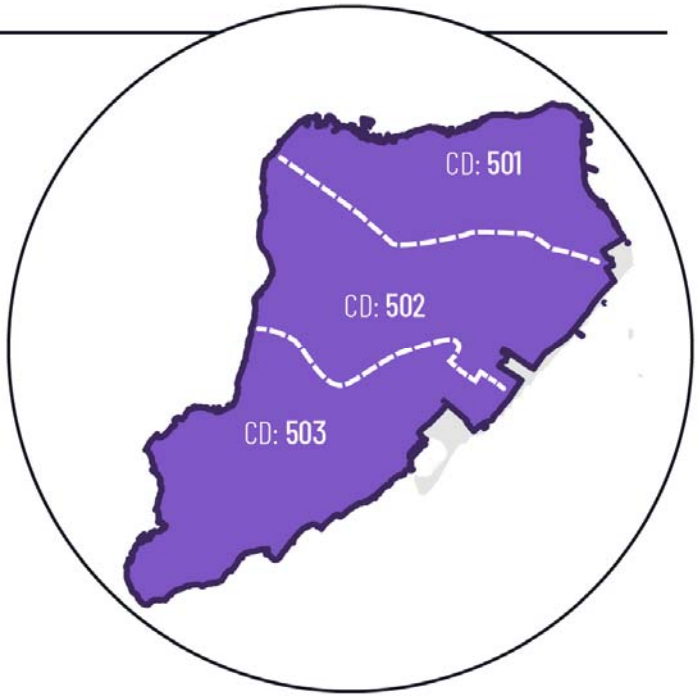
Zone Profiles

The following are close-up profiles of each of the 20 zones in the final zone design. For each zone, basic information is provided, including zone boundaries, the proposed carter cap, the current number of carters operating in that area, the predicted amount of waste generated in that zone (in tons per day), the community districts that make up the zone, and the estimated number of customers within the zone. Data provided is preliminary and is subject to revision as more updated data becomes available.

Zone SI-1

Staten Island

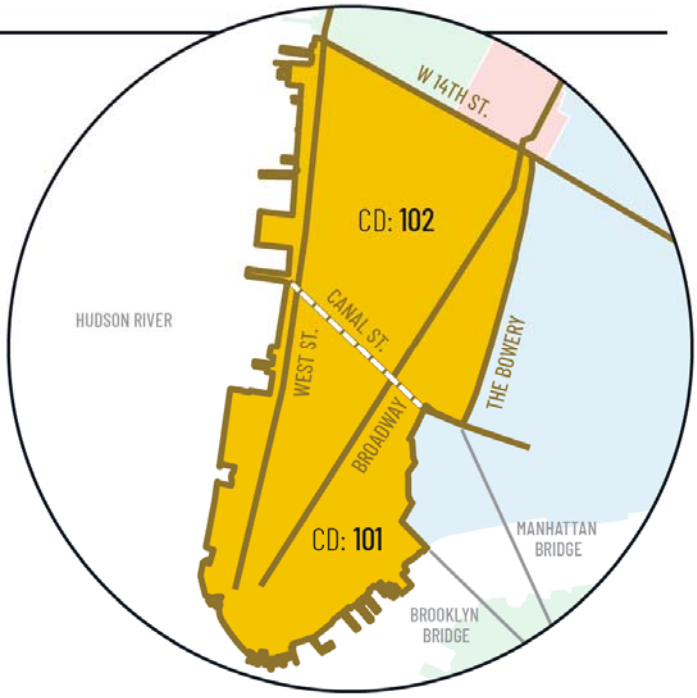
Proposed Carter Cap	3
Carters Operating	23
Predicted Tonnage tons/day	230–260
Community Districts (CD) in Zone	501, 502, 503
Customers	4,500–5,500



Zone MN-1

Manhattan

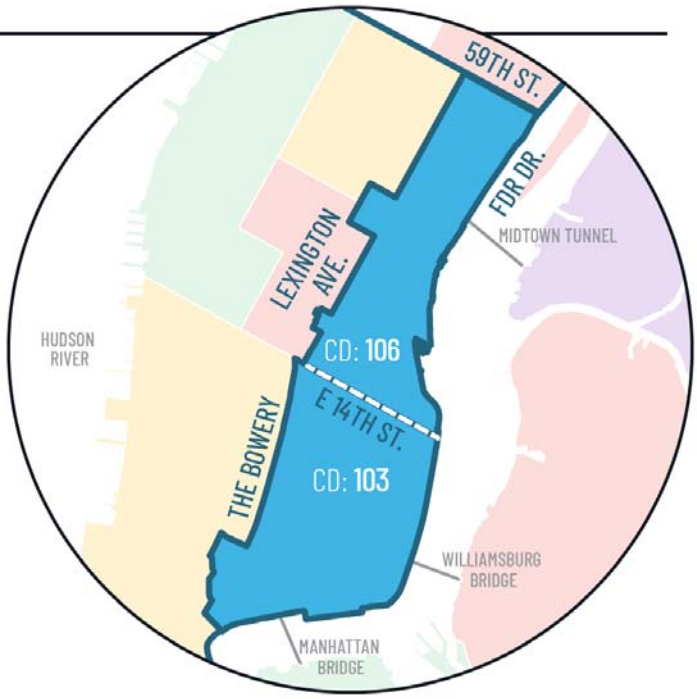
Proposed Carter Cap	4
Carters Operating	50
Predicted Tonnage tons/day	690–780
Community Districts (CD) in Zone	101, 102
Customers	6,500–7,900



Zone MN-2

Manhattan

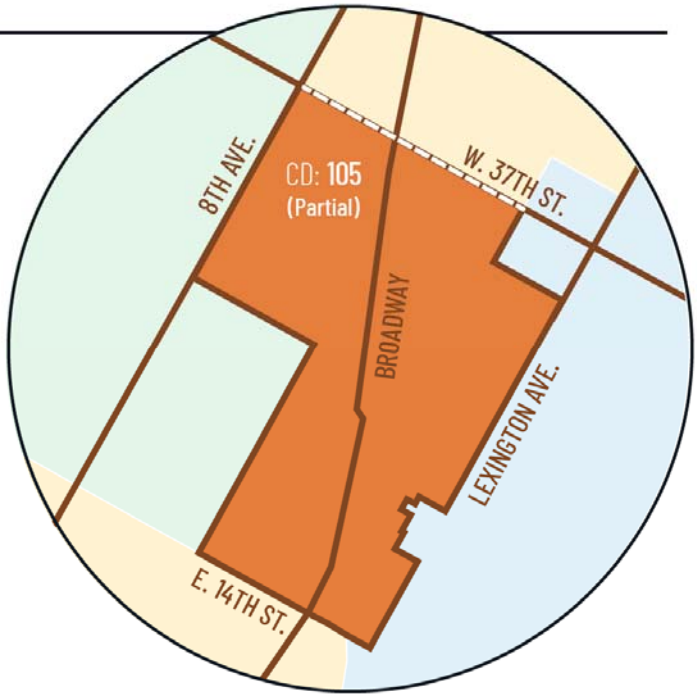
Proposed Carter Cap	4
Carters Operating	54
Predicted Tonnage tons/day	420–480
Community Districts (CD) in Zone	103, 106
Customers	5,400–6,600



Zone MN-3

Manhattan

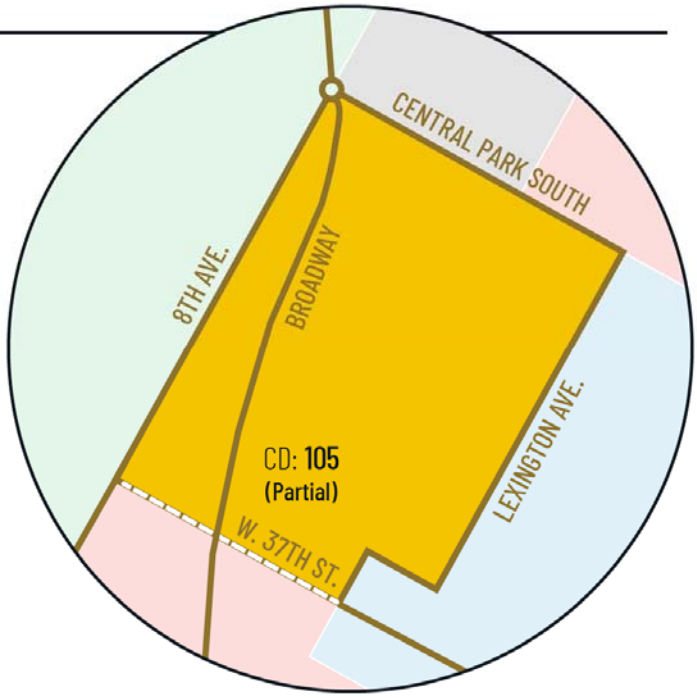
Proposed Carter Cap	5
Carters Operating	43
Predicted Tonnage tons/day	860–970
Community Districts (CD) in Zone	105 (Partial)
Customers	6,400–7,800



Zone MN-4

Manhattan

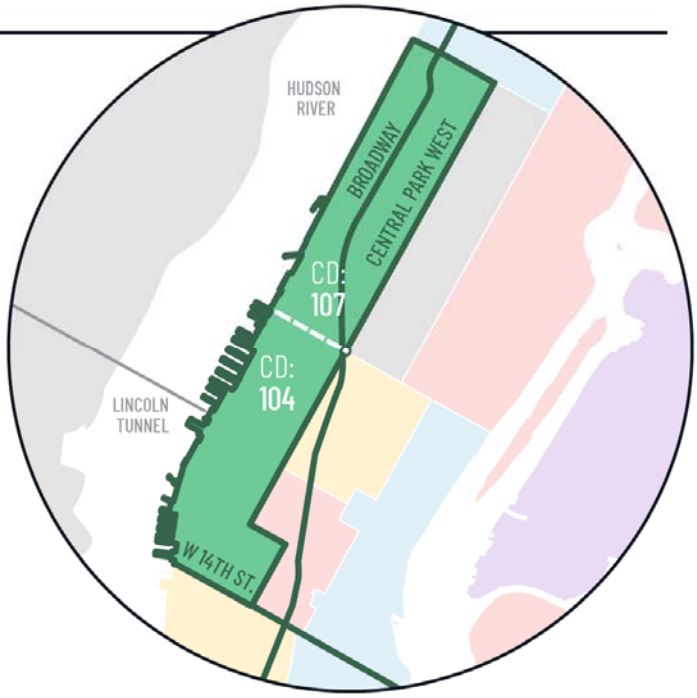
Proposed Carter Cap	5
Carters Operating	45
Predicted Tonnage tons/day	650–740
Community Districts (CD) in Zone	105 (Partial)
Customers	4,700–5,700



Zone MN-5

Manhattan

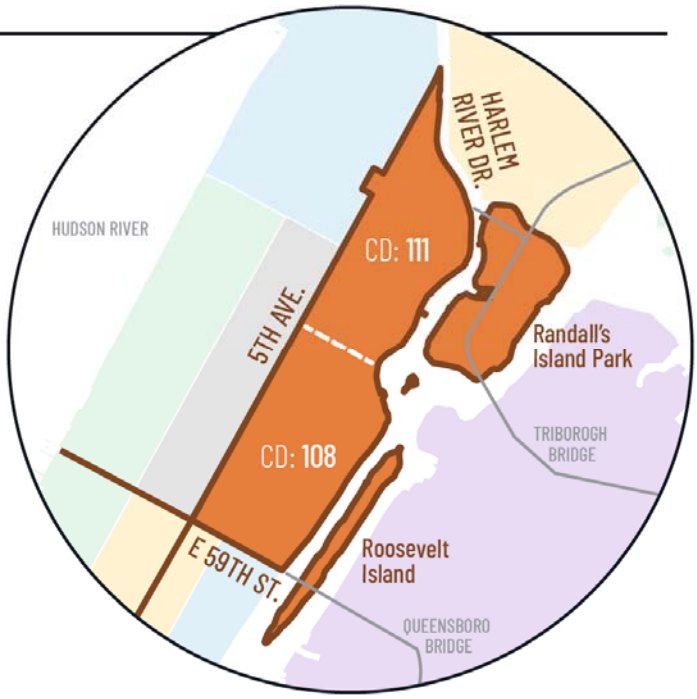
Proposed Carter Cap	4
Carters Operating	48
Predicted Tonnage tons/day	350–400
Community Districts (CD) in Zone	104, 107
Customers	5,700–6,900



Zone MN-6

Manhattan

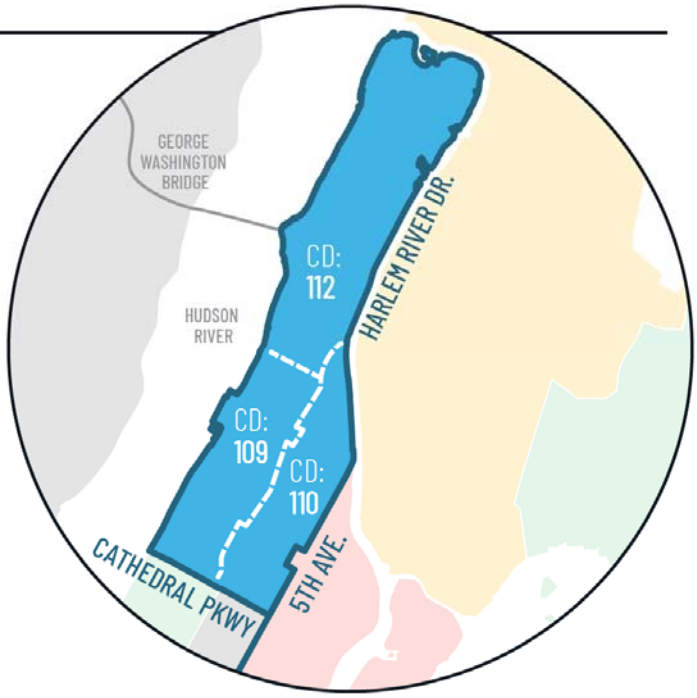
Proposed Carter Cap	4
Carters Operating	51
Predicted Tonnage tons/day	230–270
Community Districts (CD) in Zone	108, 111
Customers	5,300–6,600



Zone MN-7

Manhattan

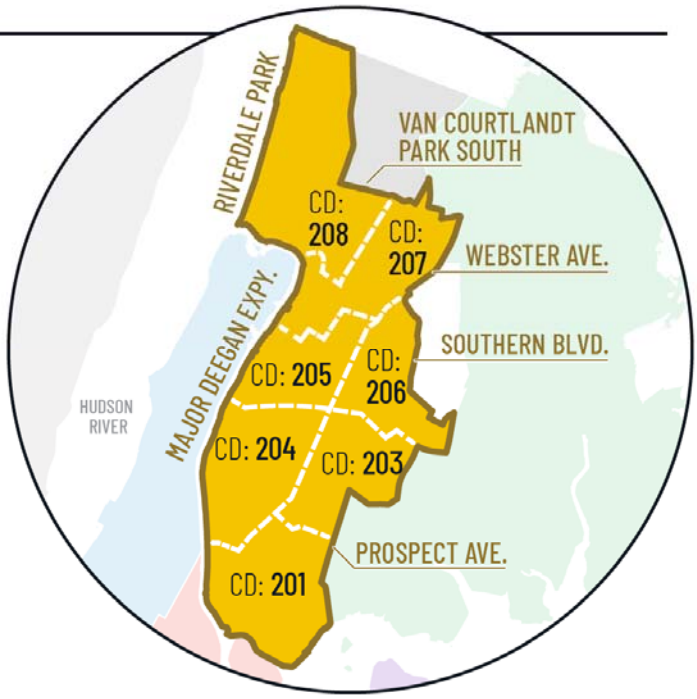
Proposed Carter Cap	3
Carters Operating	38
Predicted Tonnage tons/day	100–120
Community Districts (CD) in Zone	109, 110, 112
Customers	4,200–5,400



Zone BX-1

Bronx

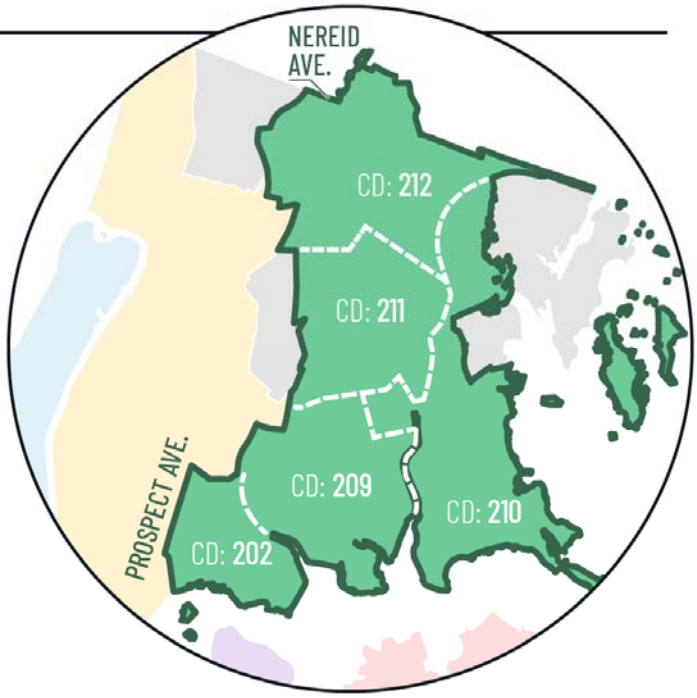
Proposed Carter Cap	3
Carters Operating	37
Predicted Tonnage tons/day	500–560
Community Districts (CD) in Zone	201, 203, 204, 205, 206, 207, 208
Customers	7,600–9,800



Zone BX-2

Bronx

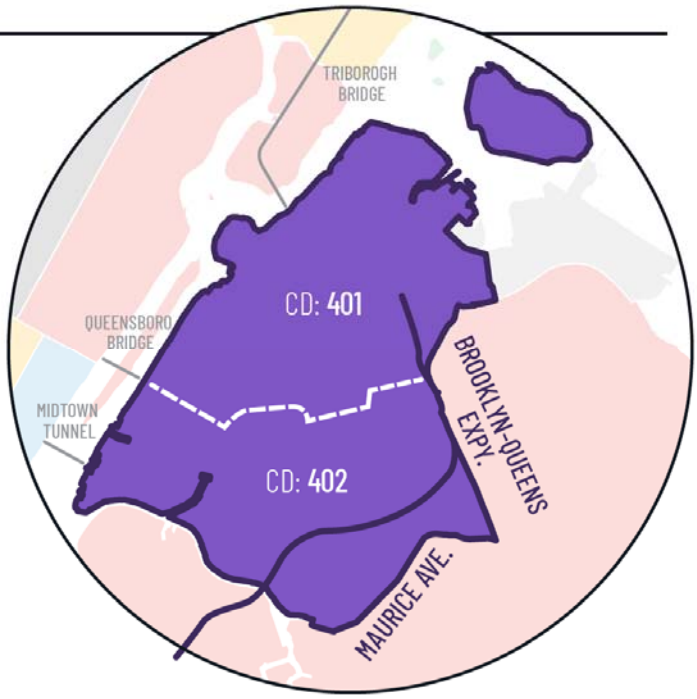
Proposed Carter Cap	3
Carters Operating	39
Predicted Tonnage tons/day	510–580
Community Districts (CD) in Zone	202, 209, 210, 211, 212
Customers	6,100–7,700



Zone QN-1

Queens

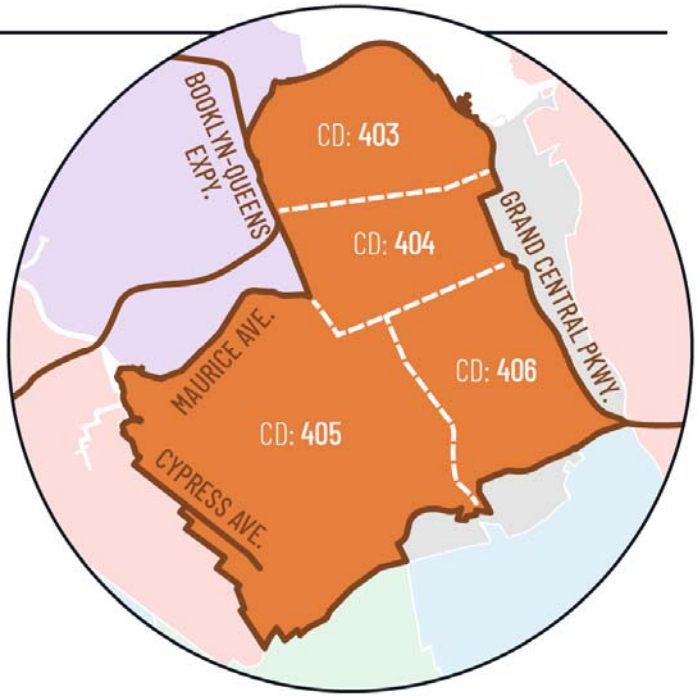
Proposed Carter Cap	3
Carters Operating	57
Predicted Tonnage tons/day	480–550
Community Districts (CD) in Zone	401, 402
Customers	6,000–8,500



Zone QN-2

Queens

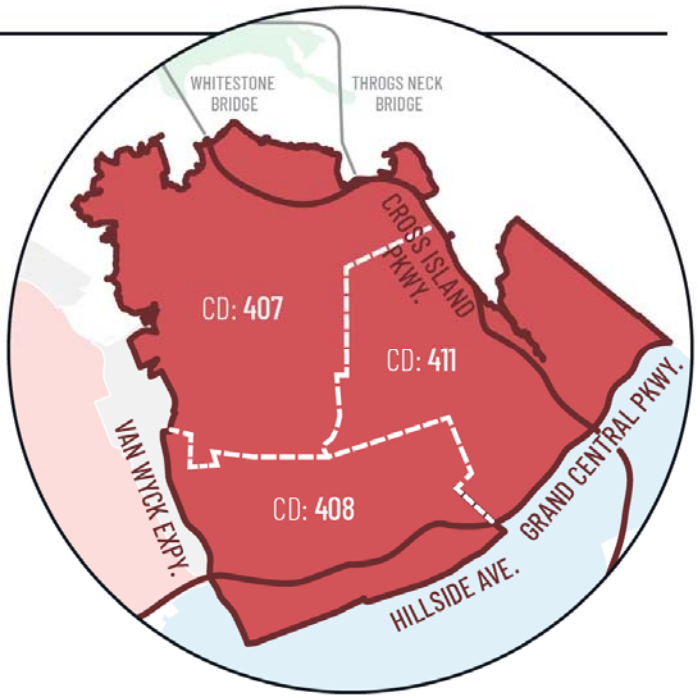
Proposed Carter Cap	3
Carters Operating	49
Predicted Tonnage tons/day	440–500
Community Districts (CD) in Zone	403, 404, 405, 406
Customers	7,500–9,200



Zone QN-3

Queens

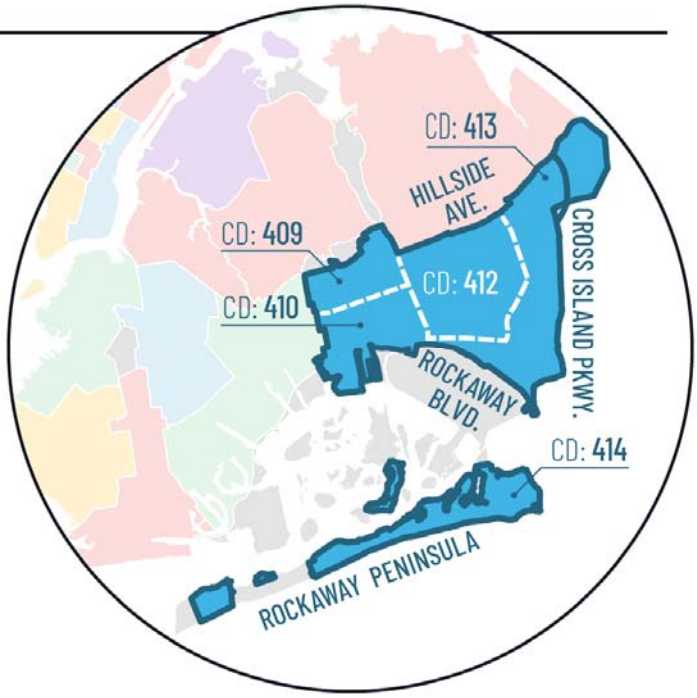
Proposed Carter Cap	3
Carters Operating	41
Predicted Tonnage tons/day	460–520
Community Districts (CD) in Zone	407, 408, 411
Customers	5,300–7,300



Zone QN-4

Queens

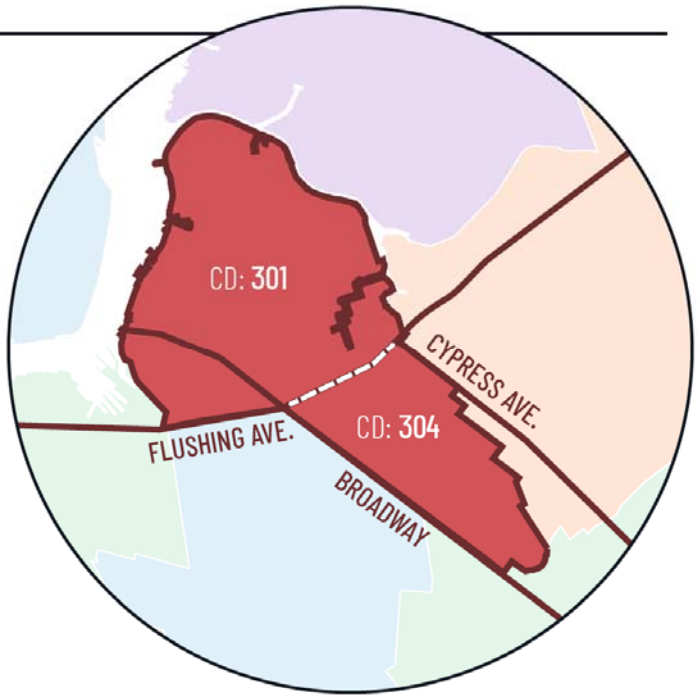
Proposed Carter Cap	3
Carters Operating	42
Predicted Tonnage tons/day	560–640
Community Districts (CD) in Zone	409, 410, 412, 413, 414
Customers	7,300–8,900



Zone BK-1

Brooklyn

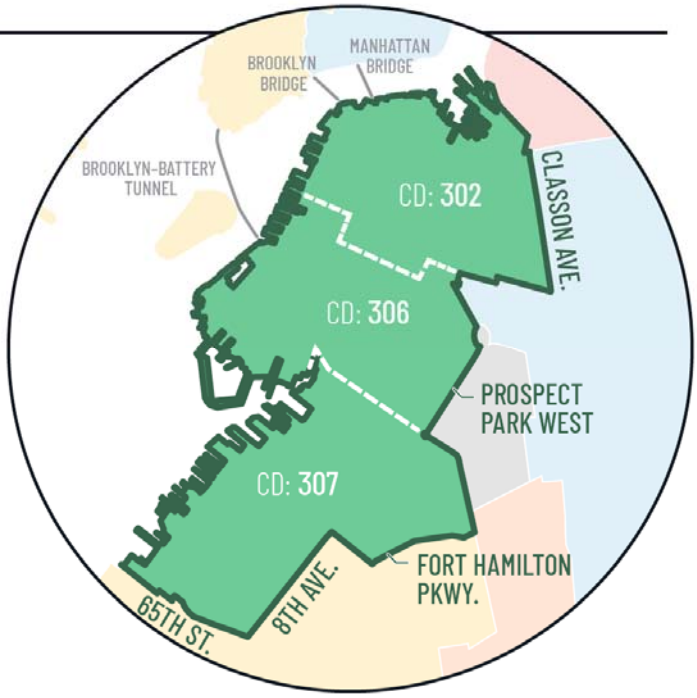
Proposed Carter Cap	3
Carters Operating	48
Predicted Tonnage tons/day	270–310
Community Districts (CD) in Zone	301, 304
Customers	5,000–6,100



Zone BK-2

Brooklyn

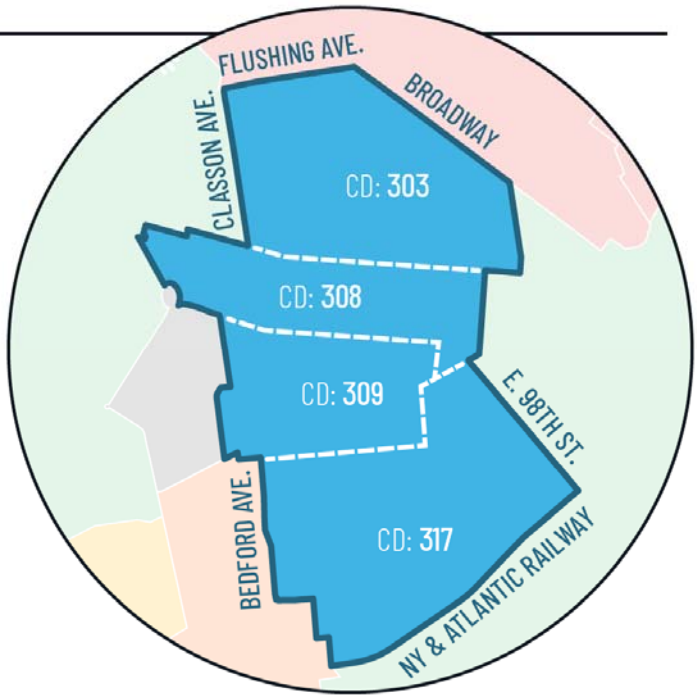
Proposed Carter Cap	3
Carters Operating	60
Predicted Tonnage tons/day	500–570
Community Districts (CD) in Zone	302, 306, 307
Customers	6,500–8,500



Zone BK-3

Brooklyn

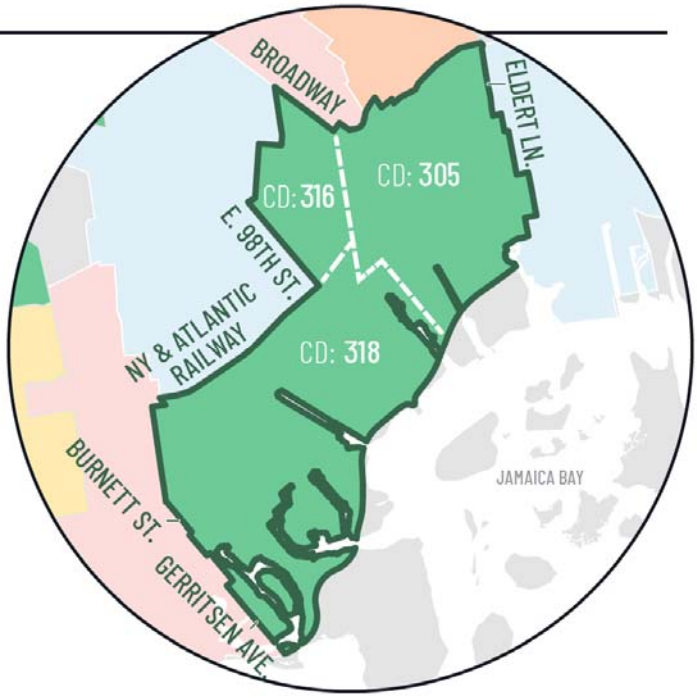
Proposed Carter Cap	3
Carters Operating	49
Predicted Tonnage tons/day	180–210
Community Districts (CD) in Zone	303, 308, 309, 317
Customers	3,800–5,600



Zone BK-4

Brooklyn

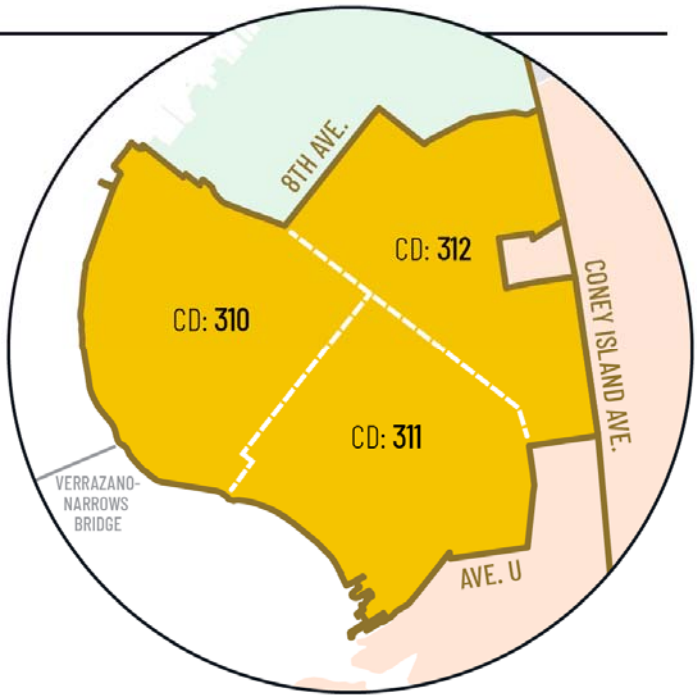
Proposed Carter Cap	3
Carters Operating	44
Predicted Tonnage tons/day	240–280
Community Districts (CD) in Zone	305, 316, 318
Customers	3,300–4,800



Zone BK-5

Brooklyn

Proposed Carter Cap	3
Carters Operating	44
Predicted Tonnage tons/day	320–370
Community Districts (CD) in Zone	310, 311, 312
Customers	6,000–7,800



Zone BK-6

Brooklyn

Proposed Carter Cap	3
Carters Operating	40
Predicted Tonnage tons/day	260–300
Community Districts (CD) in Zone	313, 314, 315
Customers	5,400–6,500