



New York City's Commercial Waste Hauling Fleets

**An Opportunity for New York City
to Ensure Cleaner Quieter
Waste Collection Operations**

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QUIETER WASTE COLLECTION OPERATIONS**

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I. Introduction

An INFORM analysis of the commercial waste carting (hauling)¹ sector in New York City has concluded that this sector deserves to be a prime target for efforts to reduce the city's still heavy burden of vehicle-related pollution that is taking such a toll on the health and the quality of life of millions of New Yorkers. Addressing the pollution from these fleets will not, and cannot, be cost-free, but there are various substantial financial incentives newly enacted at the federal level that will mitigate the costs, and innovative local policies could further reduce these costs.

INFORM's report is the first published profile of the commercial hauling sector operating in New York City, and it found the commercial hauling sector to be much larger in scope than has been previously known, with more than 3,600 trucks—many, if not most, of them aging and, hence, making a significant contribution to New York City's air pollution and, doubtless, to disruptive levels of noise, especially in areas of the city where these trucks collect wastes at night.

INFORM's study was undertaken because, in a period of expanding concern about the health effects of vehicle emissions—particularly diesel bus and truck emissions—on the city's inhabitants, little has been known about the commercial hauling sector. Heavy-duty diesel bus and truck emissions have been increasingly recognized as a significant cause of asthma attacks and the rate of these attacks is highest in the country among children in New York City's low income and minority communities. Transit and school bus and municipal refuse truck fleets have been under increasing pressure to reduce their emissions. This is not so for the commercial haulers.

A decade ago, the New York City Department of Sanitation (DSNY) pioneered in using some of the first generation of natural gas refuse trucks in the US. Operating the largest municipal refuse fleet in the country, DSNY has replaced its trucks regularly and adopted diesel pollution control and noise reduction technologies to clean its fleet. The documentation provided in this report shows that commercial hauler operations in New York City are almost one-third larger than those of DSNY, and it makes a compelling case that the city, before finalizing its 20-year Solid Waste Management Plan (SWMP) should focus greater attention on improving the practices of the commercial hauling sector.

¹ In this report, the term "commercial waste carter" or "hauler" refers to haulers that collect waste that is not collected by the New York City Department of Sanitation. The commercial haulers are private sector businesses. Generally speaking, they collect private sector, non-residential waste.

The SWMP will reduce significantly the number of long-haul tractor-trailer trucks that traverse the city transporting the waste to its final destination through the use of barge and rail transfer stations. However, the SWMP presently relies only on rerouting commercial waste hauling trucks away from some residential neighborhoods and into others to reduce their impacts on presently affected areas. Rather than shifting the impacts of commercial waste haulers elsewhere, taking steps to improve their environmental performance could mean a great deal for creating a healthier future and better quality of life for all New Yorkers.

II. Profile of the Commercial Waste Hauling Sector

The Role of Commercial Refuse/Recycling Truck Operations

Waste collection in New York City is divided between public and private fleets. The New York City Department of Sanitation (DSNY) collects residential, institutional, and public waste, and private sector haulers collect waste from private businesses and commercial establishments. The private sector also collects construction and demolition debris, wherever it is generated. Businesses and commercial establishments enter into contracts to have their waste collected by private hauling companies, which are regulated by a city agency, the Business Integrity Commission (BIC).

The BIC licenses commercial haulers and establishes standards for the issuance of licenses. Haulers of materials solely from building construction, demolition, alteration, or excavation may apply to BIC for an exemption from the licensing requirement, which BIC seems to routinely grant. (This exempted fleet operates more trucks and collects many more tons than the licensed commercial hauling fleet.) The BIC can establish requirements governing the level of service to be provided by licensees. It also sets the rates that commercial haulers can charge for the collection of waste.

Once waste is collected from customers, commercial haulers for the most part deliver their loads to transfer stations, where the loads are re-packaged for transport by rail or tractor trailer to the ultimate disposal destination. In 2004, there were approximately 69 transfer stations in the city, the bulk of which were located in four neighborhoods: Hunt's Point and Port Morris in the Bronx, Greenpoint-Williamsburg in Brooklyn, and Jamaica in Queens. One important goal of the new SWMP has been to ensure that waste transfer sites are more equitably located so that Manhattan manages much more of the wastes it generates.

Fleet Size and Operations

INFORM's profile of the commercial waste hauling sector is based on two sources of information. The first is the Commercial Waste Study (CWS) conducted in 2003 and 2004 by consultants to DSNY. This study was undertaken to assess the amount of commercial waste generated and processed in New York City and did not focus specifically on the operations of the commercial haulers. However,

the CWS included valuable information about truck operations. The second source of information is an independent survey of 250 commercial haulers conducted by INFORM to bring together data on truck operations not included in the CWS study.

Commercial Waste Study: The CWS survey, which was sent to only the 124 haulers that are licensed to handle putrescible waste and that operate in New York City, found that the 124 carters annually collected approximately 2.2 million tons of putrescible waste for disposal and 0.8 million tons for recycling—a combined annual total of 3 million tons. The study estimated (see section 3.2.2 of the CWS) the total amount of construction and demolition debris and clean fill annually collected to be 8.6 million tons, more than twice the amount of putrescible waste. In all, the CWS estimated that commercial haulers collect more than 10 million tons per year. (The commercial sector handles 75 percent of all waste generated in New York City, while DSNY handles 25 percent.) The largest portion of putrescible waste is generated in Manhattan, but the largest portion disposed of goes to Brooklyn, with the Bronx as a close second.

The 124 haulers reported having 823 vehicles, which each year drove approximately 1.4 million miles during the day and 8.2 million miles at night—an annual total of 9.6 million miles. Most of the total miles driven during the day (37 percent) were in Manhattan, with 19 percent in Queens, 18 percent in the Bronx and Brooklyn, and 8 percent in Staten Island. Forty-three percent of nighttime miles were driven in Manhattan, with 21 percent in Brooklyn, 19 percent in Queens, 13 percent in the Bronx, and 6 percent in Staten Island. As became clear when INFORM conducted its own subsequent survey (discussed next), the 823 trucks included in the CWS survey represented less than one-quarter of the commercial hauling trucks on New York City's roadways—which in total may travel roughly 40 million miles per year.

INFORM's independent survey of haulers operating in New York City: In July 2004, BIC provided INFORM with a list of 250 companies operating 1,492 licensed vehicles, the list that INFORM used to conduct its survey. Follow-up inquiries by INFORM established that even the haulers and number of trucks on that list did not represent the total number operating in New York City. It included haulers of putrescible wastes (some of whom also haul construction and demolition materials). But the haulers handling only construction and demolition debris and those hauling only their own self-generated solid waste do not need licenses if they apply to BIC for an exemption.

Although INFORM had only a partial listing of haulers in July 2004, that list was valid for INFORM's survey purposes, and in response to the requests for information sent to the 250 companies holding the licenses to the 1,492 trucks, INFORM received responses from 14, a 5-percent rate of return. These companies were operating a total of 225 vehicles (15 percent) of the 1,492 vehicles licensed at the time. Despite the limited response, the information was of considerable value in assessing the environmental performance of these vehicles and in weighing strategies for the future.

The age of trucks and scope of operations

- The average age of both trucks and engines was found to be 8 years for the responding companies, meaning that on average most refuse trucks and engines were purchased in 1996. As trucks reach this age, their environmental performance can be predicted to worsen. Engineers refer to this as the “deterioration factor.”
- On average, the responding companies operated their refuse trucks for 10 hours per day. Detailed information from one waste recycler indicated that its typical truck burned approximately 2.35 gallons of fuel per hour, ran 2,353 hours per year, and, hence, burned 5,530 gallons of diesel fuel per year.
- On average, the responding companies operated their refuse vehicles 63 miles per day—not an insubstantial amount within the confines of New York City but not fully reflective of the number of hours the engines were running, given the stop-and-start nature of their driving/duty cycles.
- Their trucks served all areas of New York City: Manhattan, Queens, Brooklyn, the Bronx, and Staten Island.

Truck refueling practices

- Most respondents refueled their vehicles once per day, with twice as many fueling their vehicles on-site compared to those that fueled their vehicles at retail establishments.

Future plans and environmental perspectives

- The responding companies expected to purchase 40 vehicles during the next three years (18 percent of the responding operators’ fleets).
- Half of the responding companies reported being “somewhat familiar” with government programs aimed at cleaner emissions. On average, the companies felt that reducing dependence on foreign oil was “somewhat important” and that fuel costs, clean air, engine noise levels, employee health, and preparation for environmental regulations were “important.”

Some deductions could be drawn even from this small sample:

- Fleets are operating reasonably old vehicles, with relatively poor emissions profiles, making attention to this huge sector exceptionally important.

- There are a significant number of new vehicles to be purchased in the upcoming years—certainly several hundreds if the total fleet replacement rate is close to the 18 percent reported by the fleets in INFORM's survey. This means opportunities to take advantage of cleaner technologies are also important to explore.
- The vehicles fuel once per day, making it possible to use only one station for refueling, whether it be at the garage or a convenient location. Typically, fleets fuel on-site, which would make it possible for them to consider the use of natural gas trucks and to have refueling infrastructure built for them on-site.
- INFORM's fuel use calculations suggest that commercial refuse hauling trucks may burn as much as 20 million gallons of diesel fuel per year, making this fleet sector one that is part of this country's risky continued total reliance on fuel made from foreign oil.
- Most fleet operators were not aware of their vehicle options or of government programs set up to promote the use of cleaner and alternative fuel vehicles. In light of the new regulatory standards that will require, at a minimum, upgrades to the diesel fleet, they could greatly benefit from having information to make decisions about future fleet composition. Given the higher costs that will be involved in purchasing and operating diesel trucks in 2007 and thereafter, fleets may turn to cheaper and very old and even more polluting trucks. Hence, their awareness of *all* choices, including the natural gas option, is crucial.

The Commercial Waste Hauling Sector's Emissions Contribution to NYC Air Pollution

Although INFORM's survey focused on operators of the 1,492 trucks in service in 2004, INFORM's more recent data from BIC, provided in August 2005, documented 1,545 licensed trucks entitled to haul putrescible waste and construction and demolition debris, 1,752 trucks exempt from licensing because they haul only construction and demolition debris, and 310 more self-haulers—a total of 3,607 privately operated collection vehicles carrying wastes in New York City, possibly 1,400 more trucks than are operated by DSNY.

Because many of the commercial fleets' vehicles are old and operate many hours per day in a stop-and-go driving cycle that involves frequent idling, they are inefficient users of fuel and produce significant emissions. INFORM calculated truck emissions based on several assumptions: (1) The trucks, as indicated in INFORM's in-person interviews, are in operation roughly 2,500 hours per year; (2) they have a load factor of about 195 (which is the average horsepower actually used by the vehicle); and (3) their emissions are in line with calculations based on EPA certification levels. EPA's certification standard for 1996 engines allowed emissions of 0.1 gram per brake-horsepower/hour (g/b-hp/hr) of particulate matter (PM) and 5.0 grams of nitrogen oxide (NO_x) per brake-

horsepower hour (compared to 0.01 PM g/b-hp/hr and 0.2 g/b-hp/hr NOx that will be required for 2010 engines).

Based on the above assumptions, INFORM calculated that the 1,545 licensed commercial trucks may generate approximately 4,000 tons of health-threatening PM and NOx emissions annually. For the total 3,607 trucks hauling any type of waste, the emissions total would be 9,500 tons of PM and NOx emissions annually or 114,000 tons of pollutants during the 12-year lifecycle of these vehicles.

III. Strategies for Improving the Environmental Performance of Commercial Waste Hauling Fleets

The initial profile that INFORM was able to create from the available sources of information indicates that strategies to improve the emissions performance of these fleets should include:

1. Retiring the oldest, most polluting vehicles in the fleets
2. Purchasing new vehicles that, in line with national and New York State public policy priorities, achieve the greatest emissions reductions *and* reduced reliance on foreign oil-derived fuel—purchases that can now capitalize on the federal funding available in 2006
3. Adopting retrofit technologies for use on the diesel vehicles that are too new to retire and, hence, will remain in service for some years

1. Retiring the oldest, most polluting vehicles in the fleets

Old diesel trucks pollute the air of the neighborhoods through which they travel. Their emissions threaten the health of those who operate them, and their fumes clog the loading docks of commercial buildings when they back into these loading docks but must keep their engines running as part of their normal duty cycle to collect and compact wastes.

The amount of pollution emitted by a truck depends on a number of factors, with the age of the vehicle being a key determinant. The federal government has tightened the standards for truck engines over time so that a 2005 engine emits far fewer pollutants than a 1998 engine. In addition, engine performance deteriorates over time so that a 1998 engine is likely to emit many more pollutants in 2005 than it did when it was new. Consequently, the newer the vehicle, the better its emissions performance will be.

INFORM's survey found commercial haulers' trucks on average to be of 1996 vintage, and because refuse trucks produced before 1998, when pollution control requirements were made more stringent, tend to be much more polluting, measures that result in the retirement of all pre-1998 trucks would improve the fleets' emission performance greatly.

There are various public policy measures that could be used to achieve the retirement of pre-1998 vehicles. These include the following:

- The BIC's ability to require the retirement of pre-1998 vehicles within a given timeframe as a condition for licensing should be explored. (Connecticut is considering such a proposal.)
- If legally feasible, the BIC could create an emissions inspection program as part of the licensing function for trucks. A certain number of older trucks will not be able to pass the inspection and have to be replaced. DSNY and/or the Department of Environmental Protection (DEP) could be involved in the creation of such a program, which could use DSNY's planned heavy-duty emissions testing lab. The Taxi and Limousine Commission has its own emissions inspection program for the 13,000 NYC taxis.
- The BIC could develop a type of "bounty" program whereby fleets are paid to turn in their old vehicles. Such "scrappage" programs have been instituted in California in the past.

2. Purchasing new trucks: the cleanest, quietest, and least dependent on oil-derived fuel

Of all refuse truck fuel and technology options, natural gas refuse trucks are today's optimal choice for new fleet purchases, having three advantages over diesel: they are cleaner, they are quieter, and they use a fuel that is more secure than oil, most of it available domestically or from Canada. (For a brief summary of the two major studies of refuse truck choices and trends conducted in the US, see appendix I.) Furthermore, the cost difference between diesel and natural gas trucks that now exists could very likely be eliminated within the foreseeable future. Thus, it makes sense for commercial haulers to carefully assess the benefits of making their choice for new trucks natural gas models.

1. The emissions advantages of natural gas trucks

First, natural gas is an inherently less polluting fuel than diesel because natural gas contains less carbon.

Second, although diesel engines have improved their emissions performance through the use of aftermarket treatment technology that traps some of the pollutants that are produced when the fuel is burned, natural gas has an advantage because its low level of emissions does not depend so much on add-on technology, which can malfunction and is likely to deteriorate over time. For example, particulate emissions for natural gas vehicles are reduced by a simple oxidation catalyst; diesel vehicles will require advanced control technologies *and* the use of 15 parts per million (ppm) ultra low sulfur diesel fuel to achieve comparable particulate emission reductions. In addition, commercially available diesel

aftermarket treatment technology has not yet reliably reduced emissions of nitrogen oxide, an important contributor to ozone pollution.

New engines sold in 2007 will have to meet greatly reduced emissions standards set by the US Environmental Protection Agency (EPA). Both diesel and natural gas engines will have to meet these standards. However, natural gas engines have already shown their ability to certify not only at the required 2007 levels but even at the still-lower levels that will be required in 2010. Furthermore, the natural gas vehicles that will be available in 2007 will be certified at 0.2 grams—1 gram less than the 1.2 grams required in nitrogen oxide emissions—surpassing the 2007 standard and achieving the 2010 standard three years early. The difference could mean one ton fewer nitrogen oxide emissions throughout the seven-year life for each truck in operation.

2. The noise advantages of natural gas trucks

Diesel garbage trucks can generate noise levels of up to 100 decibels. Because natural gas engines are spark-ignited rather than compression ignited, which allows them to operate at much lower compression ratios, their engines are significantly quieter. Natural gas trucks have been found to pose fewer threats to the hearing and well-being of their drivers. The standards set by the US Occupational Safety and Health Administration (OSHA) permit employees to be exposed to 90 decibels for up to eight hours, a level that diesel trucks come dangerously close to and may often exceed. The newly passed noise code for New York City includes a focus on truck waste compaction noise but not on noise from truck engines.

An in-depth study of noise levels experienced by refuse truck workers, conducted in Velsen, the Netherlands, found that, with natural gas trucks, noise levels experienced by drivers dropped by more than 90 percent (from 82.8 to 71.3 dB). Levels experienced by workers standing beside the trucks decreased 98 percent (from 79.5 to 69.3 dB), while levels experienced by workers behind the trucks dropped more than 50 percent. Dutch workers reported a high level of satisfaction with noise reductions. Spokespeople for two-thirds of the natural gas garbage truck programs studied by INFORM for its 2002 report on the refuse truck industry (*Greening Garbage Trucks*) said that operators noticed less noise. At one site, operators cited the quietness of the trucks as their greatest asset.

3. The energy security advantages of natural gas fuel

Although the issue of US independence from foreign oil has been a top national priority for more than a decade, it has been largely ignored until recently. The US relies on foreign sources of oil for more than 60 percent of the oil it consumes, while New York State, which imports 85 percent of its oil, is the most dependent of any state in the country. Long-term trends (continuing instability in the Middle East and the rapid increase in

oil consumption by industrializing Asia) suggest that oil prices are likely to stay high and price spikes as well as supply disruptions may increasingly occur. Diversifying the commercial fleets through the use of natural gas fuel will help safeguard fleet operations.

Natural gas in New York is purchased primarily from US and Canadian suppliers. Moreover, natural gas trucks will soon be able to take advantage of the gases generated from landfills and wastewater treatment plants—gases that now escape as pollutants. This will be a win-win situation for the environment and the fleets.

4. The improving economics of natural gas trucks

Natural gas trucks are en route to becoming economically competitive with diesel trucks. Up to now, natural gas trucks have cost approximately \$40,000 to \$50,000 more than diesel trucks and for fleets making the shift, there may be further costs in modifying garages and maintenance facilities and in training workers. However, the cost of diesel trucks is already increasing by as much as \$10,000 to \$12,000 because of changes required in the vehicles to meet the 2007 standards, and operating these cleaner diesel vehicles will further increase their costs. Meanwhile, the federal government, in line with its goal of promoting cleaner alternative fuel vehicles, has established a program of federal tax credits that will mitigate most of the incremental costs of natural gas trucks. The 2005 Energy Policy Act contains credits that can cover up to \$32,000 (with a maximum of 80 percent) of the incremental costs of natural gas trucks and up to \$30,000 of the cost of a new fueling station.

Even though the prices of diesel and natural gas fuels have risen dramatically in the past year, the price of natural gas fuel has remained cheaper than diesel at the pump, and the 2005 Highway Bill will be providing a new federal excise tax credit equal to \$0.50 per gasoline gallon equivalent of alternative fuel (partially offset by an increase in the tax rate for alternative fuels). Looking ahead, the new federal air pollution standards that are set for engines sold in 2007 (mentioned above) and even tighter standards in 2010 are likely to increase fuel consumption by diesel trucks because of the demands of the aftermarket treatment technology.

An important 2005 study by an independent California research firm, TIAX, has estimated that the new requirements being placed on diesel trucks will totally erase the cost advantage of diesel over natural gas trucks within a few years.

There are various public policy measures that could be used as incentives to promote the purchase of new natural gas trucks:

- The BIC could reduce the licensing fee for alternative fuel trucks, or the city could find other ways to offset costs for fleets that adopt

natural gas, such as tax rebates, operating flexibility, or a modified rate structure.

- The city could provide preferential treatment for natural gas trucks at the transfer stations it controls—such as allowing these trucks to go to the head of the queue or providing discounts on tipping fees.
- The city could incorporate natural gas refueling into its plans for retrofitting transfer stations, removing the lack of refueling as an obstacle for fleets.
- The city could give preference in contracting with transfer station operators to those willing to provide incentives for natural gas trucks or install natural gas refueling equipment.
- The city could, through the BIC or another agency, establish an information and education center that would provide assistance to fleets with new purchases and that would serve as an interface and coordinator between vehicle manufacturers, fuel suppliers, and fleets.

3. Adopting retrofit technologies on vehicles remaining in service

New York City has already indicated its concern about the emissions of commercial refuse haulers by requiring, under the city's new Local Law 40 of 2005, that commercial haulers that contract with the city use "best available retrofit technology" (BART) on their operating diesel vehicles. Similarly, DSNY has indicated that it is undertaking a program to retrofit its diesel fleet.

However, the commercial haulers that contract with the city appear to be a very small percentage of the private hauling fleets.² Thus, the bulk of the 3,607 commercial vehicles remain untouched by these commendable initiatives. So the thousands of tons of pollutants that they generate annually, mostly in densely populated areas, continue to threaten the health of New Yorkers—most of all the young, the elderly, and those with respiratory ailments.

To optimize the emissions reductions for the portion of these fleets that will continue to be on the city's streets for a number of years, the city could set diesel retrofit requirements and timeframes for the entire sector, and it could explore strategies such as grants, other financial incentives, or authorization for fleets to raise their rates so that they can remain profitable. Technical assistance would also be needed to help fleets evaluate the relative benefits of upgrading pollution controls on their diesel trucks or of replacing them with new natural gas or other cleaner or more efficient trucks.

² The draft SWMP shows that the city currently has contracts with eight companies. This number will be reduced when the new system of waste management proposed in the SWMP is implemented.

IV. Recommendations for SWMP Action

1. The SWMP should contain measures for reducing the emissions of all commercial waste hauling fleets—measures aimed at retiring the oldest trucks, purchasing the cleanest, quietest new trucks, and improving the pollution controls on diesel-powered vehicles.

The 3,607 vehicles that collect the city's commercial waste are at present largely immune from efforts to reduce their emissions. DSNY is undertaking major efforts to improve its own fleet and those of entities with whom it contracts. Yet the SWMP does not attempt to address the effects of the vast majority of commercial trucks on city neighborhoods; at most, it only shifts the areas where they will operate.

As the city succeeds in creating a new commercial waste transfer station and/or provides significant access for commercial haulers at the transfer stations it will operate directly, it behooves the city to set the best standard of operation and to minimize the impacts on the surrounding community, wherever located. All city-owned or sponsored transfer sites must operate in such a manner as to reduce to an absolute minimum any nuisance or health risk for their neighbors, and this will not be possible unless considerable change is wrought in the commercial truck fleets, whether by requirement, incentive, or both.

Hence, the SWMP should commit to the three fleet improvement goals discussed above and to exploring strategies to achieve them as the city sets forth its framework for solid waste management for the next 20 years.

2. The SWMP should commit to using DSNY's sophisticated monitoring equipment or finding other means to compare the on-road performance, air emissions, and noise levels of diesel trucks, natural gas refuse trucks, and other clean fuel or advanced technology trucks as they become commercially available. These findings should be made public.

DSNY is setting an example for the commercial haulers by taking a number of measures to improve the emissions performance of its fleet. DSNY purchases new vehicles on a seven-year cycle, which significantly contributes to maintaining a clean fleet. DSNY is also in the process of retrofitting all of the existing diesel trucks that will remain in service for a considerable time with recently available add-on devices that have the potential to improve emissions. (In 2005, approximately 10 percent of the DSNY fleet had been retrofitted with either oxidation catalysts or particulate filters, and 100 percent of the fleet used low sulfur diesel [30 parts per million].)

DSNY's move to retrofit in-service diesel trucks is commendable. However, sufficient doubts exist about whether the emissions performance of diesel trucks

using ultra low sulfur diesel fuel and retrofit pollution control technologies will equal that of new natural gas trucks. DSNY, using its sophisticated monitoring equipment to track and compare the emissions of diesel and new natural gas trucks, could make a national contribution by documenting the relative performance of these technologies. Hybrid refuse truck technology, not yet commercial, is being developed in the UK and US and may constitute another choice that will deserve to be evaluated in the foreseeable future.

3. The SWMP should endorse an expanded role for the Business Integrity Commission to track fleet emissions, to encourage fleet innovation, and to identify organizations that can provide technical assistance about alternative fuel vehicle options and financial support.

The BIC, at present, oversees commercial hauler operations, sets rates, and licenses fleets to operate. It has significant power over the hauling industry in the city. To the extent that the environmental performance of trucks in all of these commercial fleets need improving, the BIC might play an important role.

The BIC may have the authority to institute age requirements for vehicles, require annual or biannual emissions inspections for these trucks, or design a scrappage program. It could also be granted such authority through legislation.

To better understand the pollution load of this sector and to track progress in its performance, the BIC should be enabled to compile, on an ongoing basis, data about the number of trucks operating on the streets of New York City, their age, hours of operation, fuel consumed, and the miles they travel each day. It is worth exploring whether the BIC could use its authority as part of its licensing function to gather such information. The emissions profile of this sector would be modeled based on the operating characteristics. (Having these data would enable the New York City DEP or the state DEC to more accurately estimate all vehicle sector emissions in New York City, leading to the design of a more realistic State Implementation Plan (SIP).

Moreover, the BIC could serve as a center for information about the available economic incentives that would enable commercial haulers to choose alternative fuel trucks, especially the new less polluting and quieter natural gas trucks that are a commercial choice. The BIC might be the appropriate venue for coordinating an educational initiative with the US Department of Energy's New York City Clean Cities program or other appropriate programs, making commercial haulers more aware of the choices they have for pollution reduction and alternative fuel initiatives, of the partners they will need if they wish to explore affordable natural gas initiatives, and of funding opportunities. Haulers may need the assistance of these or other groups in applying for such funding.

4. The SWMP should commit to exploring and advancing incentives for the use of natural gas in trucks that bring wastes to city transfer stations—such as requiring the installation of natural gas refueling at the transfer stations it controls or granting broader access

(perhaps preferential tipping hours)—or otherwise facilitating fleet use of a clean, non-petroleum-based fuel.

Building natural gas refueling infrastructure into new or retrofitted waste transfer stations in New York City will enable fleets to choose the vehicles they think will be most beneficial for their operations. With natural gas refueling equipment in place, these sites will be able to provide hydrogen fuel tomorrow by simply adding equipment that can extract the hydrogen from natural gas and condense it—paving the way to the hydrogen era.

Providing incentives such as reduced tipping fees or enabling trucks to go to the head of the queue at transfer stations controlled by DSNY could provide sufficient impetus for fleets to make the change to natural gas when buying new vehicles.

V. Conclusion

INFORM's analysis indicates that by its sheer size—some 3,607 trucks—the commercial waste hauling sector deserves much more attention that it has received to date. This sector may have as many as 1,400 more trucks than the New York City Department of Sanitation's huge fleet, so the total refuse truck hauling sector may be as large as 6,000 trucks, which has a significant combined impact on the quality of life in New York City. SWMP's attention to this sector could dramatically improve the city's future.

Appendix: The Potential for Cleaner, Quieter Refuse Trucks

Greening Garbage Trucks: 2002

To date, only one definitive study has been conducted on the scope and performance of the refuse and recycling truck sector in the US—the report prepared by INFORM and titled *Greening Garbage Trucks: New Technologies for Cleaner Air*. This report, funded by the US Department of Energy, was completed in late 2002. It has been a sought after resource by government, business, and municipal planners involved in environmental, health, and energy planning. The report has been a central resource used in educational workshops hosted by leaders in all of these sectors from Long Island and Texas to New Mexico and California.

Greening Garbage Trucks research included the following findings:

- More than 136,000 refuse trucks are operating in the US—a total that is almost three times the number of transit buses.
- Refuse trucks, which have a pervasive presence in cities across the US, are among the oldest, least fuel-efficient, and most polluting trucks on US roads.
- Because these trucks operate in much closer proximity to large numbers of people than most diesel trucks (they traverse virtually every street in urban centers as they collect wastes), their emissions pose exceptional health threats in residential neighborhoods.
- Diesel refuse trucks pose particular health risks to the workers who operate them, not only as a result of inhaling their emissions but also as a result of their high noise levels.
- Diesel refuse trucks are no longer the only refuse truck option. As of 2002, one other commercial option existed—natural gas trucks. INFORM documented almost 700 natural gas-powered trucks operating in 26 US cities. These natural gas trucks, burning a fuel with much less carbon than diesel fuel, are less polluting than their diesel counterparts and significantly quieter.
- Natural gas refuse trucks are a technology choice that could reduce the heavy pollution affecting urban areas across the US while helping safeguard these fleets, which provide a vital municipal service, from the price spikes and risks related to total dependence on a fuel relying on foreign oil.

INFORM's 2002 research concluded that natural gas trucks had the potential to revolutionize this fleet sector, making it possible for these trucks to provide their indispensable service to the city while performing as “better neighbors.”

INFORM's 2005 Update

In 2005, INFORM revisited the refuse truck industry to see what effects broader awareness of the industry's options, changes in the regulatory climate, and changes in the market for diesel and natural gas have had on the trend toward the increasing use of natural gas or other alternative fuels by the garbage truck industry.

The forthcoming report *Greening Garbage Trucks: Trends in Alternative Fuels Use, 2002–2005* found budding interest in the use of bio-methane and landfill gas as fuels for refuse trucks in the US and around the world and interest in hybrid technology. However, the report found continued robust and rapid growth in the use of natural gas trucks.