



National University Rail Center - NURail
US DOT OST-R Tier 1 University Transportation Center

NURail Project ID: NURail 2015-UIC-R15

**Exploring the Potential for Off Peak Delivery in Metropolitan Chicago:
Research Findings and Conclusions**

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August 15, 2016

Grant Number: DTRT13-G-UTC52

DISCLAIMER

Funding for this research was provided by the NURail Center, University of Illinois at Urbana - Champaign under Grant No. DTRT12-G-UTC18 of the U.S. Department of Transportation, Office of the Assistant Secretary for Research & Technology (OST-R), University Transportation Centers Program. The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the information presented herein. This document is disseminated under the sponsorship of the U.S. Department of Transportation's University Transportation Centers Program, in the interest of information exchange. The U.S. Government assumes no liability for the contents or use thereof.



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TECHNICAL SUMMARY

Title

Exploring the Potential for Off Peak Delivery in Metropolitan Chicago: Research Findings and Conclusions

Introduction

Businesses generally want to receive deliveries during their normal work hours. Truckers need to schedule deliveries to meet those demands. As a result, most truck deliveries occur during the most congested daytime traffic periods.

If more businesses would accept deliveries in off peak times when there is less traffic congestion, trucks could deliver goods faster and at less cost. That would reduce congestion and cost of goods, and yield economic and environmental benefits.

This report summarizes our research over the past two years on possible strategies to shift more deliveries of goods to times when traffic is light – i.e., off-peak delivery (OPD) – as one way to lessen congestion in the Chicago area.

Approach and Methodology

The research included review of literature and case studies, data analysis, mapping, interviews and policy analysis.

Findings

Findings and conclusions are presented, including the potential benefits of OPD, how various OPD programs have been implemented, challenges to achieving more OPD, how market forces affect potential for OPD, and possible strategies to achieve more OPD.

Conclusions

1. OPD programs have been successfully implemented in several places around the world.

2. OPD can yield substantial benefits, but it can be challenging to implement.
3. The benefits and costs of OPD are not always evenly distributed.
4. Some OPD is happening now, but further efforts should be made to shift deliveries to off-peak times. There are several ways that more OPD can happen in Chicago.

Recommendations

Instead of this report serving as the basis for launching a pilot program now, it presents research and options as a foundation for future efforts by interested organizations to consider and adopt strategies and methods to shift more deliveries to off-peak times.

Publications

N/A

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Introduction and Executive Summary

Businesses generally want to receive deliveries during their normal work hours. Truckers need to schedule deliveries to meet those demands. As a result, most truck deliveries occur during the most congested daytime traffic periods.

If more businesses would accept deliveries in off peak times when there is less traffic congestion, trucks could deliver goods faster and at less cost. That would reduce congestion and cost of goods, and yield economic and environmental benefits.

This report summarizes our research over the past two years on possible strategies to shift more deliveries of goods to times when traffic is light – i.e., off-peak delivery (OPD) – as one way to lessen congestion in the Chicago area. The research included review of literature and case studies, data analysis, mapping, interviews and policy analysis. Findings and conclusions are presented, including the potential benefits of OPD, how various OPD programs have been implemented, challenges to achieving more OPD, how market forces affect potential for OPD, and possible strategies to achieve more OPD.

Our primary business leadership collaborator has been the Supply Chain Innovation Network of Chicago (SINC). SINC is an organization of freight business CEOs launched in late 2013 by World Business Chicago to build the region's freight-related economy and make goods movement more efficient.

Funding for this research was provided by The National University Rail Center (NURail) and the Illinois Department of Transportation, for which the Urban Transportation Center is very grateful. We are also grateful to the many organizations that have contributed helpful data, advice and information, including SINC, Chicago Metropolitan Agency for Planning (CMAP), Chicago Department of Transportation (CDOT), Illinois Department of Transportation (IDOT), Mid-West Truckers Association, World Business Chicago, Chicago Loop Alliance, Chicago Central Area Committee, Northwestern Memorial Hospital, Northwestern Medical School, Lurie Children's Hospital, Rensselaer Polytechnic Institute, New York City Department of Transportation, Florida Department of Transportation, District of Columbia Department of Transportation, PierPass and others.

This project began with a shared desire by the Urban Transportation Center (UTC) research team and SINC to design and implement a pilot program to incentivize off-peak deliveries in the Chicago area. However, when results of the research were shared with stakeholders, the responses led to a different result. No source of funds for OPD incentives has been found. No business organization has been identified that is currently in a position to sponsor an OPD incentive program. Further, although several public agencies have supported the concept of shifting more deliveries to off-peak times, none has made it an immediate priority.

As a result, instead of this report serving as the basis for launching a pilot program now, it provides a foundation for future efforts by interested organizations to consider and adopt strategies and methods to shift more deliveries to off-peak times.

Findings and conclusions discussed in this report include:

- 1) OPD programs have been successfully implemented in several places around the world.
- 2) OPD can yield substantial benefits, but it can be challenging to implement.
- 3) The benefits and costs of OPD are not always evenly distributed. Carriers generally like the idea because it can save them time and money, but receiving businesses often resist it because it is inconvenient for them and can add costs. OPD offers broad public benefits from lessened congestion and improved air quality, but neighbors may have concerns about nighttime noise. An OPD program would need to be carefully designed to balance the benefits and costs to make it practical for carriers, receivers, shippers, customers and the community.
- 4) Some OPD is happening now, but better data is needed to understand its extent.
- 5) Further efforts should be made to shift deliveries to off-peak times. There are several ways that more OPD can happen in Chicago, including:
 - a) Launching a campaign to identify and publicly recognize businesses that are taking off-peak deliveries and encourage more to do it.
 - a) Offering businesses various incentives to shift receipt of deliveries to off-peak times.
 - b) Shippers and truckers (who can benefit from reduced costs of OPD) could offer favorable pricing to customers who shift receipt of deliveries to off-peak times.
 - c) Transportation demand management strategies such as congestion pricing, supported by technology, could be used to shift some traffic and reduce peak time congestion.
 - d) Regulatory measures could require certain types of businesses in congested areas to shift some deliveries to off-peak times.
 - e) As a possible first step, design and implement an off-peak delivery pilot program.

Case studies, maps, data analysis and sample surveys are included in the Appendix to support further OPD implementation efforts.

Off-Peak Delivery can reduce traffic congestion, speed goods movement and improve communities and the environment.

1. Traffic congestion costs everyone.

Traffic congestion and delay increases the cost of delivering goods. Congestion in metropolitan Chicago consistently ranks amongst the worst in the country. Congestion costs the region's economy approximately \$7.3 billion annually.ⁱ Trucks represent about 10% of the region's traffic and 67% of the region's total freight volume, which both contributes to and is impacted by area congestion.ⁱⁱ Of the \$2 trillion in goods carried by trucks in the region, about 29% is delivered locallyⁱⁱⁱ.

2. Traffic congestion slows goods movement and increases costs.

The impact of congestion is distributed throughout the supply chain in terms of slower goods movement and higher costs. Congestion data prepared by CMAP shows that on several corridors where truck volumes are over 10,000 per day, congestion during morning peak periods increases travel times by an average of 60%. Many regional arterials and collector streets are also severely congested. On many area highways, in order to assure on-time arrival during the peak period it requires doubling the scheduled travel time of free-flow conditions.^{iv}

3. Peak period deliveries are a challenge for communities.

As trucks wind their way through snarled traffic to deliver goods, their impact does not go unnoticed by communities and their residents. In the 2014 CMAP Municipal Survey, 70% (weighted by population) reported that delivery impacts during peak periods are a challenge for their community.^v They use various regulatory measures and fines to restrict truck movements and they invest in improvements to add capacity and maintain the roadways. But until now there has been little use of direct incentives to shift deliveries to off-peak periods in the Chicago area.

4. Off-peak delivery can yield significant benefits.

The off-peak delivery pilot program in New York City demonstrated how this form of traffic demand management can benefit a wide variety of stakeholders. Pedestrians and cyclists experience increased safety and an improved quality of life with less interference from deliveries; daytime non-freight travelers benefit from faster travel speeds; freight carriers see increased productivity; and receivers enjoy increased reliability.^{vi} Analysis of the pilot project suggests that implementing long-term OPD policies in Manhattan would lead to travel time savings to all highway users of 3 to 5 minutes per trip. Carriers switching to the off-hours would save about 48 minutes in travel time and between one and three hours in total service time for

each delivery tour.^{vii} In addition, there would be significant reductions in parking fines, which frequently exceed \$1,000 per truck per month.^{viii}

Studies estimate that if fully funded, the NYC program could switch an excess of 20% of daytime freight delivery traffic to the off-hours. Conducting off-hour deliveries is about 30% cheaper for carriers than delivering during regular hours. The total economic benefit is estimated at \$150 million to \$200 million per year in travel time savings and pollution reductions.^{ix}

5. Off-peak delivery can impact the entire supply chain.

In addition to the trucking industry, there is the potential for companies up and down the supply chain to benefit. It could increase efficiency and capacity of the rail freight system. Within the Chicago region, the six class one railroads generate approximately 15,000 truck trips to and from their customers each day.^x An additional 7,500 truck trips are made each day between rail intermodal facilities.^{xi} Improvements to the truck freight system could carry over to rail freight in particular.

Highlights of OPD Benefits

Overall economic benefits: A study of OPD in New York City showed that implementing various OPD policies would generate a total savings of between \$100 and \$200 million/year in travel time savings and pollution reduction.^{xii}

- Travel time savings to all highway users were estimated at approximately 3-5 minutes per trip.^{xiii}
- Off-Peak Delivery is estimated to be 30-40% cheaper for carriers than regular daytime deliveries.^{xiv} According to the New York City study, carriers that switch to off-hours would save about 48 minutes in travel time per delivery tour and 1 to 3 hours in total service time per delivery tour.^{xv}

Increased efficiency and reliability:

- OPD can increase vehicle utilization. Surveys of the New York City freight system show that 25% of truck trips are empty and only 20% of the truck capacity is utilized.^{xvi}
- At the conclusion of the New York City pilot project, the main reason cited by receivers for continuing with off-peak delivery was its increased reliability.

Safety: Reduced congestion during peak periods leads to increased safety for pedestrians, cyclists, and other vehicles.

Improved air and environmental quality: Reduced travel time leads to a corresponding reduction in environmental pollutants.

OPD Can Yield Significant Benefits to Carriers, Receivers, and Travelers

- Reduced peak time congestion
- Reduced costs
- Time savings
- Reduced parking fines
- Increased reliability
- Improved safety
- Economic benefits
- Less pollution

Other Regions Have Tried OPD.

A review of literature found a number of examples of off-peak delivery programs that have been tried or implemented. Case studies based on that research are presented in Appendix 1. Some of them are highlighted below.

Other Regions Have Tried OPD

New York

- Initially a pilot project with 35 receivers, the long-term program now has more than 400 participants.

PierPass, Ports of Long Beach and Los Angeles

- PierPass began Off Peak in 2005 and by 2008 shifted 45% of container cargo to off peak shifts; still reporting more than 30% shift from peak to off peak.

Barcelona

- Began in 2003 with two grocery stores receiving off peak deliveries, by 2010 spread to over 400 stores in 35 provinces.

London

- Implemented off peak deliveries during the 2012 Olympics and currently conducting OPD trials in addition to cordon pricing in central London.
-

Dublin

- Cordon pricing in addition to limitations on heavy goods vehicles from 7am to 7pm. In 2011, approximately 25% of all food deliveries occurred during off-peak hours.

The Netherlands

- Fostered innovations in low-noise technologies and behaviors resulting in standards now used in over 50 cities with 1,400 quiet deliveries a week.

Orlando Pilot

- Hospital system Orlando Health is currently piloting OPD on their main campus in "South of Downtown Orlando."

Washington D.C. Pilot

- OPD was listed as a strategy to improve the movement and delivery of goods in the District's 2014 freight plan and is now being implemented through a pilot project.
-

New York City – Rensselaer Polytechnic Pilot



- Pilot project involved 35 receivers and 20 trucks/vendors.
- Half of participants did staffed OPD and half did unassisted OPD (store provided driver with a key or passcode).
- Receivers were given a \$2,000 incentive to participate; carriers got \$300 per truck.
- After the pilot all receivers doing staffed OPD reverted back to regular daytime deliveries, but almost all receivers doing unassisted OPD remained in the off-hours because of its reliability.

Results:

- Off-hour deliveries cost carriers about 30% less -- carriers save about 48 minutes in travel time and 1 to 3 hours in total service time for each delivery tour.
- Parking fines, often exceeding \$1,000 per truck per month, are reduced.
- OPD policies in Manhattan could save all highway users 3-5 minutes per trip.
- Long term OPD policies would save between \$100 and \$200 million/year in travel time and pollution reduction.
- Reduced peak time congestion makes it safer for pedestrians, cyclists and vehicles.
- Reduced travel time leads to a reduction in environmental pollutants.

More than 400 companies are participating in the permanent Off Hours Delivery program.

Find out more at <http://www.nyc.gov/html/dot/html/motorist/offhoursdelivery.shtml>

PierPass OffPeak – Ports of LA and Long Beach



- Los Angeles and Long Beach terminal operators launched PierPass OffPeak July 23, 2005.
- OffPeak uses pricing to reduce congestion and delay at the ports.
- International terminals established five OffPeak shifts per week:
 - 6:00 p.m. to 3:00 a.m. Monday through Thursday
 - 8:00 a.m. to 5:00 p.m. on Saturday
- No fee for containers entering or exiting the terminals during off-peak hours.
- Containers entering or exiting by road during peak hours (3:00 a.m. to 6:00 p.m. Monday to Friday) are charged a Traffic Mitigation Fee.
- By 2008, 45% of container cargo traffic shifted to off peak; still reporting more than 30% shifted.
- By 2014, OffPeak had diverted more than 30 million total truck trips from peak to off-peak times.
- More information can be found at <http://www.pierpass.org/>

Barcelona – Mercadona Supermarket Silent Nighttime Unloading Program



- Pilot project began in 2003 at two Mercadona supermarket locations. Deliveries took place from 11pm-midnight and 5am-6am. Large 40 ton trucks replaced small delivery vans.
- The pilot sought to determine:
 - a) The feasibility of silent night deliveries
 - b) The return on investment for vehicle adaptations and night shifts
- Noise reducing measures included carpeted flooring in the truck, low noise lifting system, carriers with low-noise rubber wheels, and staff training to minimize verbal communication and other noises.

Results

- Noise level during loading and unloading complied with regulations and differed very little from ambient conditions. No noise complaints from nearby residents.
- The pilot led Mercadona supermarkets to set up two night-time deliveries using large 40 ton trucks instead of seven peak-hour deliveries using vans.
- Mercadona estimated that full investment in vehicle adaptation is recoverable within three years.
- Following success of the pilot, Mercadona implemented a nationwide Silent Nighttime Unloading Program. By 2010, it had expanded to 407 stores in 35 provinces. They estimate that in 2010 their vehicles spent up to 80 percent less time in city centers, reducing congestion and noise and eliminating 70,000 tons of CO2 emissions.

Real-world challenges limit the potential for shifting deliveries to off-peak times.

1. There is a mismatch between benefits and costs.

Many of the benefits of off-peak delivery, such as reduced congestion, improved air quality and safety would accrue to the greater community, not just the carriers or receiving businesses. For example, in the New York pilot it was estimated that 90% of the congestion reduction benefit was region-wide, not just in the pilot project area.^{xvii} Increased night time noise may be a concern for residents but can be mitigated with low-noise strategies and equipment, driver training, and enforcement.

Businesses have not generally perceived that the benefit of taking deliveries in off hours would exceed the costs. Businesses might not directly see the increased costs of peak period deliveries because those costs are often spread throughout the market. Or, they may have calculated that receiving goods in off hours would cost more in staff time and security measures than they might save from reduced delivery charges. Or, they might not have thought about it at all.

2. Businesses generally want to receive deliveries when they are open.

As noted earlier, most businesses receive deliveries during the daytime. Receivers create freight demand and specify delivery times. They are the customers of the freight system and greatly influence how the supply chain operates. Truckers have reported that even higher tolls during peak times won't make them shift trips to off-peak times because they have to meet delivery requirements of their customers. A study of variable tolling in New York concluded the higher tolls had little impact on daytime delivery traffic because carriers needed to meet the demands of the receiving businesses which wanted deliveries when they were open for business.^{xviii} Similarly, a majority of truckers responding to a recent Illinois Tollway survey said that they could not generally travel during off-peak times because of the need to meet required pick-up and delivery times of shippers and receivers.^{xix}

3. Location and industry type can affect participation.

Receiving businesses and carriers may be more or less likely to participate in OPD based on their geographic location and industry type, which affect such things as delivery cost and the number of delivery stops made.^{xx}

- Businesses that are most receptive to off-peak deliveries are those that would likely be open during off-peak hours anyway, such as restaurants, bars, hotels, convenience stores, 24-hour supermarkets, big-box retailers and medical facilities.

- Carriers have a financial incentive to participate in OPD, but this incentive is diminished if only a few of their receivers are interested in OPD and the carrier must make two separate trips (one in the day and one at night).
- Larger establishments (more than 250 employees) and buildings with many businesses yield the greatest savings in terms of the number of truck trips and cost effective implementation, as additional costs can be shared among more customers.

Unassisted off-peak delivery may have more potential for some types of businesses.

One type of off-peak delivery involves providing a setting for unassisted drop-offs. This requires some investment in physical improvements to create a secure area, but less ongoing staff expense.

- Unassisted deliveries have a greater potential for long term success. After the New York pilot concluded, almost all of the receivers doing unassisted OPD remained in the off-hours because of its reliability, without any additional incentives.^{xxi} However, when the pilot ended all of the receivers doing staffed OPD reverted back to regular daytime deliveries even though they were satisfied with their experience in the pilot.
- With unassisted OPD, liability issues decrease when receivers provide the driver with keys for the first set of double doors or install a virtual cage, which restricts drivers to an area marked off by sensors.^{xxii}
- The more deliveries an establishment receives, the less likely they are to participate in unassisted off-peak deliveries.

Unassisted off peak delivery may have more potential for some types of businesses.

- It involves providing a setting for unassisted drop-offs.
- It may require some investment to create a secure area – options include:
 - Delivery lockers
 - Double doors
 - Electronic key boxes
 - Virtual cages with deliveries entered through a hand-held scanner
- Less ongoing staff expense can enhance long term success.



Consolidated delivery centers can facilitate OPD.

Consolidated delivery centers are facilities at which goods from multiple sources can be delivered, sorted, and consolidated to allow fewer deliveries to the final destination. Consolidation can allow more flexibility of delivery times to the center or to the final destination, allowing more trips to occur during off hours. This model has been used with success at the Atlanta Olympics and in pilot projects in Germany and the UK. During a pilot project in Bristol, UK, consolidated deliveries resulted in a 73% reduction in delivery movements and a 65% reduction in vehicle mileage.^{xxiii} In those places, multiple businesses took advantage of the consolidated delivery center to share freight services. However, consolidated delivery centers can also be of use to a single large building or campus in a congested area. For example, Orlando Health uses a consolidated delivery center offsite of their campus, which is located in a congested area south of downtown Orlando. Deliveries arrive at the less congested consolidated delivery center and are sorted and consolidated for delivery to the main campus during off hours. Other examples of consolidated delivery include:

- "The Green Link" in Paris offers urban service delivery. The Green Link is responsible for taking charge of last mile deliveries for carriers such as FedEx. The company has a network of urban freight terminals located in dense Paris neighborhoods called "Green Hubs". The goods are unloaded and loaded into electric vehicles and on cargo-bikes. An information system provides real-time management.
- The London Boroughs Consolidation Centre (LBCC) is a facility that channels suppliers' deliveries into one central point. The goods are then sorted onto fewer vehicles for the last mile of the journey to final delivery sites, on a just in time basis. Initially four suppliers delivered to the LBCC, but over time the number has increased to 72.

Truckers make some off-peak deliveries now and could do more if receivers were willing.

To better understand the needs and preferences of trucking firms and aid in designing the pilot program, a survey was drafted that the Mid-West Truckers Association distributed to its members. Although the number of responses was small, several findings from the initial responses are worth noting:

- About 25% of the respondents already make deliveries in the off hours of 7pm to 6am; they all make deliveries from 6am-10am; more than half also make deliveries from 10am to 3pm; fewer than 10% make deliveries from 3pm to 7pm.
- Nearly 75% of respondents said that if receivers were willing, it would be easy or somewhat easy to make deliveries during off-peak hours. (Those that indicated

implementing OPD would be difficult cited problems such as freight that needs constant refrigeration, shipper's hours, and logistics for loading the next delivery.)

- Respondents agreed that making deliveries during off-peak hours would be less expensive – perhaps as much as 30-40% cheaper than delivering during the day. However, only 18% indicated they would give a discount as high as 10% to deliver in the off-peak hours.
- Nearly 75% of respondents indicated that they might be interested in participating in an off-peak delivery pilot project.

These responses suggest that while truckers could be interested in doing more off-peak deliveries, and off-peak deliveries would reduce their costs by as much as 30-40%, few would be interested in offering a discount to businesses that would shift deliveries to off hours.

One possible interpretation of this is that the cost savings need to be proven before truckers would actually offer a discount for off-peak deliveries. Another interpretation is that truckers guess that the competitive market would lead their shipping or receiving customers to expect lower prices for off-peak deliveries, leaving the truckers no better off financially.

We need to better understand how the shipper, carrier and receiver relate to one another. The carrier is, to a degree, squeezed between the shipper and receiver. The carrier is generally chosen by the shipper to gain the best overall value in terms of reliability and cost. And the receiver has chosen to do business with the shipper for similar reasons in addition to an overall assessment of quality. So while the receiver dictates when the delivery should be made, the cost of delivery is just one of several factors considered.

Incentives can help correct the mismatch between benefits and costs of an OPD program.

Researchers in the New York program concluded that because receivers may be satisfied with the status quo, incentives are necessary to persuade them to participate in OPD. This can include a combination of one-time financial incentives, public recognition for outstanding service, or discounts from vendors for accepting OPD.^{xxiv}

In some cases, however, financial incentives may not be needed. For example, in Barcelona the one chain supermarket that tested OPD has since expanded its use to over 100 of its store locations throughout Spain, without any incentives.^{xxv} Orlando Health, the major health system in Orlando is implementing OPD with no other incentive than to improve congestion and foot traffic around their facilities.

In New York, participants in the pilot project received a one-time financial incentive. Receivers were given \$2,000 and carriers were given \$300 per participating truck. Receivers could use the incentive to pay nighttime staff to accept the deliveries or for equipment to accept unassisted deliveries. About half of the receivers used their staff to accept OPD, so paying the additional staff used up most of the incentive. The other half allowed the vendors to have access to their establishment to deposit the OPD, so their staff did not need to be present and the incentive became a net profit.^{xxvi}

Subsequent research found that a \$10,000/year incentive to receivers would maximize the program's net benefits. At that amount, the combined economic benefit for carriers and road users exceeds the total incentive cost to receivers and maximizes the net benefit. As the incentive grows, the net benefit declines as the costs increase at an accelerating pace due to the increasing incentive amount and the increasing number of establishments that take the incentive. Beyond an incentive of \$15,000/year to receivers, the total costs outweigh the benefits of OPD. The study also found that increasing OPD at large traffic generators has the potential to produce comparable economic benefits for a \$5,000 incentive to individual establishment receivers, at only a small fraction of the cost.^{xxvii}

In the ports of Los Angeles and Long Beach, the PierPass OffPeak program offers an incentive for cargo moved during off-peak shifts. PierPass is a not-for-profit company created by marine terminal operators at the ports of Los Angeles and Long Beach, California to address multi-terminal issues such as congestion, security, and air quality. The company created a market-based incentive program called OffPeak. The program provides an incentive for cargo owners to move cargo at night and on weekends (off-peak shifts) to reduce truck traffic and pollution during peak daytime hours and to alleviate port congestion. PierPass is the only permanent off-peak program in the United States.

Beginning July 23, 2005, all international container terminals at the Los Angeles and Long Beach ports established five OffPeak shifts per week on nights and weekends. Containers entering or exiting the terminals by road during peak hours (3:00 a.m. to 6:00 p.m. Monday through Friday) are charged a Traffic Mitigation Fee. No fee is charged for containers entering or exiting the terminals during off-peak hours.

Since 2005, the Traffic Mitigation Fee (TMF) has been assessed on all loaded containers entering or exiting marine terminal gates by road during peak daytime hours. The initial fee was \$40 per TEU (20-foot equivalent unit), or \$80 for all containers larger than 20 feet. By 2014 the fee had increased to \$66.50 per twenty-foot container, or \$133 per forty foot container. The fee is adjusted annually to reflect increases in labor costs based on maritime labor cost

figures.^{xxviii} There is no fee assessed for empty containers and chassis, domestic containers, or transshipment to other ports or on all traffic that is handled through the marine terminal gates during off-peak hours. Nor is there a fee for intermodal containers that depart or arrive via the Alameda Corridor for import or export, or that pay an ACTA (Alameda Corridor Transit Authority) fee. The beneficial cargo owners (shippers, consignees, or their agents) are responsible for the fee payment. The trucking community and water carriers are not responsible for the payment.

The TMF payments, minus PierPass expenses, are allocated by PierPass to the marine terminals to help offset their incremental costs to operate the extra shifts. The estimated annual cost to the terminal operators of operating the extra shifts is \$156 million to \$160 million.

The results of the OffPeak program have been impressive. The initial goal was to shift 15-20% of all cargo movement to OffPeak within the first year and 30-35% within two years, but after just 10 weeks PierPass reported that they had exceeded their goal for the year. In October 2005, PierPass reported that the program had shifted 30-35% of container cargo at all ports to OffPeak shifts on a typical day; by July 2008 that grew to 45%.^{xxix}

While the Chicago freight system's complex multi-corridor layout could make it difficult to duplicate PierPass OffPeak here, it is worth understanding the idea and considering how time of day pricing could produce similar benefits.

Washington D.C. is recruiting businesses to participate in an OPD pilot program and will offer a sliding scale of incentives that may range from a large one-time incentive to pay for facility or equipment changes to enable unassisted overnight deliveries to smaller incentives for night-time staff to receive deliveries.

Regulations and public policies can affect OPD.

Public policies and regulations can be significant in incentivizing, or inducing, businesses to participate in an OPD program. Studies and experience in California and New York concluded that active support from government is needed to achieve long-term implementation of off-peak delivery. The Urban Freeway Gridlock Study that examined alternatives to reduce congestion in California's freeway system concluded that implementation of off-peak delivery would depend on governments requiring shippers and receivers to change their delivery and operating schemes.^{xxx} Ultimately, it was the threat of action by the California legislature that led terminal operators to organize and implement the PierPass OffPeak program. New York researchers also concluded that cooperation and support from the City would be important to achieve a successful OPD program.

In the Chicago metropolitan area, regulations and restrictions that impact OPD vary by municipality. They can range from prohibitions on overnight deliveries to limitations on idling, noise, or exhaust. There is no centralized database of these restrictions in metropolitan Chicago. However, the Chicago Metropolitan Agency for Planning conducted a municipal survey in 2014 which revealed that 46% of respondents – 70% when weighted by population – find delivery impacts during peak periods “somewhat of a challenge” or “more of a challenge.” Likewise, inadequate on-street loading zones were “somewhat” or “more of a challenge” for 49% of respondents.

Chicago regulations are relatively neutral on off-peak delivery.

Within Chicago, there is no ordinance generally restricting overnight delivery, but there are time of day regulations for individual parcels that have been established through the land development process. For example, an alderman required Northwestern Memorial Hospital and their associated facilities to submit monthly reports to the alderman’s office that detail “unscheduled” daytime deliveries (mostly by UPS and FedEx); they continue to submit those reports. One might surmise that the alderman who requested those reports was interested in limiting daytime deliveries.

In the Municipal Code of Chicago, the Chicago Zoning Ordinance (Title 17) and the Chicago Traffic Code (Title 9) contain most of the pertinent rules and regulations that impact freight movements. The Zoning Ordinance addresses zoning for parking and loading; it defines the quantity and design standards for required freight facilities for new developments. The Department of Planning and Development and Department of Transportation review site plans for new developments to ensure proper design.

In Title 9, the Chicago Traffic Code, Chapter 64 addresses parking regulations, Chapter 68 addresses restricted parking, and Chapter 72 addresses vehicle size and weight limits. While there are certain restrictions on truck access to the central business district area, trucks making deliveries within the central business district are exempt from these provisions. The *Traffic Code* includes regulations that limit truck movements, lists fines for illegal activities, and regulates loading zone placement and use. The *Traffic Code* is enforced by the Chicago Police Department and the Office of Emergency Management and Communications (OEMC).

CDOT is interested in shifting more deliveries to off-peak times to lessen congestion.

The City of Chicago has focused much attention on reducing congestion and improving traffic circulation in the downtown area. Officials at the Chicago Department of Transportation have

shown interest in having more businesses accept deliveries in off-peak times. The 2008 Chicago Downtown Freight Study included the following among its more than 60 recommendations:

*“Encourage off-peak deliveries:
Freight deliveries can operate more efficiently if there is dock access during off-peak (non-business) hours, thereby spreading the number of delivery vehicles and their competition for limited loading facilities over a longer period of time. However, building managers are reluctant to allow access to docks during non-business hours due to potential additional operating costs and/or security issues. Currently, New York City is exploring the provision of tax subsidies for additional employees to staff loading facilities during offpeak hours, a concept that may be applicable to Chicago. The City can work with BOMA to identify other potential incentives.”^{xxxix}*

The same 2008 study said “Encourage off-peak deliveries” could be a potential short-term initiative that could reduce illegal parking and reduce peak hour traffic with no interruption of deliveries. It noted the challenge of getting building manager buy-in, and that extra costs to buildings may require incentives. It also noted the need to involve the Building Owners and Managers Association in addition to trucking firms and CDOT. Other recommendations included various fees and fines in peak periods that could further encourage shifting some deliveries to off-peak times.^{xxxii} A summary of the recommendations in the 2008 study is included in Appendix 4.

Several actions, from voluntary to regulatory, could shift more deliveries to off-peak times.

Actions that might be taken to achieve more OPD range from convening and encouraging voluntary action to adopting new ordinances and regulations.

A. Voluntary action – some initial options

A simple but worthwhile step would be for SINC and/or CDOT to meet with members of the Midwest Truckers Association and Illinois Trucking Association to discuss results of the truckers survey, gain more input, explore opportunities to achieve more off-peak deliveries, and develop an action agenda.

The City (including Mayor’s office, CDOT, aldermen) could convene a meeting of businesses, perhaps in cooperation with SINC, Chicago Loop Alliance, Building Owners and Managers Association (BOMA) and/or World Business Chicago to explore options for shifting more deliveries to off-peak times. Through such a process, an action agenda could be developed to lessen congestion while supporting vital economic activity in the Loop. Similar efforts in other

congested areas could be undertaken. A survey of businesses could be included in this process to better understand business needs and practices, and see how more OPD might be done.

The City, again in cooperation with SINC and others, could invite representatives of UPS and FedEx, and perhaps Amazon, to discuss the extent to which deliveries could be made at times when there is less impact on traffic congestion. It might be possible for such companies to structure delivery routes and offer pricing incentives for customers who accept deliveries at off-peak times. The Northwestern Medical Center area is one of many areas that could benefit from such action. This effort could be especially timely given the steady trend toward more on-line purchasing and direct delivery.

With active engagement of organizations like UI Labs – City Digital and technology companies, strategies and methods could be developed and piloted to more effectively utilize street space and enable more efficient use of loading zones that are already regulated by ordinance. City Digital is a collaboration of business, government, university and civic leaders seeking to best apply technology to address urban challenges, including transportation.

B. Regulatory action

Regulatory action may be in order if the City is really motivated to shift more deliveries to off-peak times. It would be important to make best use of technology, as mentioned above, to support sound regulations. Elements that could be included in an ordinance aimed at requiring more off-peak delivery in Chicago include, for example, the following:

Suggested Goal: 50% of deliveries received by certain types of businesses will be made in off-peak times in designated areas of the city. Businesses affected would include restaurants, bars, grocery stores, hotels, hospitals and others with hours extending beyond identified peak hours.

Suggested Ordinance provisions:

- Define peak and off-peak times in designated areas of the City.
- Define designated areas covered by this ordinance.
- Define types of businesses covered by this ordinance in the designated areas.
- Designate additional parking areas and loading zones available for deliveries during off-peak times.
- Create a special commercial vehicle parking permit authorizing use of designated parking areas during off-peak times.
- Increase fines for parking violations during peak periods in designated areas.
- Require businesses covered by this ordinance in designated areas of the City to regularly submit reports to CDOT stating: time of day and number of deliveries received; and additional costs incurred, if any, for handling off-peak deliveries.

- Assess a fee to businesses covered by this ordinance for each month that less than 50% of deliveries occur in off-peak times.
- The ordinance could be designed as a pilot project in effect for a limited time, perhaps three years, to ensure that results are evaluated and modifications made before renewal.

For local policies and regulations to be most effective, they should be supported by consistent regional and state policies. This could include such measures as congestion pricing on major roadways and parking regulations and fees that vary by time of day. A number of policy and regulatory options were suggested in the Chicago Downtown Freight Study; some pertinent excerpts are included in Appendix 4.

Two areas were identified and analyzed for a possible OPD pilot program in Chicago.

Appendix 2 contains maps reflecting an analysis of locations of the types of businesses most likely to participate in an OPD program – businesses in the retail trade, health care, accommodations and food services industries that have more than 100 employees. Also included in Appendix 2 are CMAP maps of traffic delay and travel time reliability, and a UTC analysis of locations of truck parking citations and truck citation density.

Analysis of those maps and data resulted in identification of several locations where businesses most likely to participate in OPD are densely located and where an OPD program could substantially reduce peak period traffic volume. Subsequently, the Chicago downtown “Loop” and the Northwestern Memorial Hospital area east of North Michigan Avenue were identified for consideration of a possible OPD pilot. Preliminary analysis of those areas indicates that some OPD is already happening, and there are both opportunities and challenges for implementing OPD.

A. Chicago downtown “Loop”

The density of business activity coupled with chronic traffic congestion make the downtown area a natural target for OPD. The 2008 CDOT downtown freight study recommended that off-peak delivery be considered for this area. The research team and SINC introduced OPD to businesses at a downtown seminar in June 2015. The idea of doing an OPD pilot project was discussed with several downtown organizations that have been supportive of the concept of off-peak delivery including the Chicago Loop Alliance, Chicago Central Area Committee and World Business Chicago. While there was general support from business organizations for the idea of OPD, practical concerns arose including:

- Concern that OPD might add costs to businesses.

- Doubts about whether enough businesses would do OPD voluntarily if it wasn't required.
- Concern that aldermen might object if there were any complaints from residents about possible negative impacts such as noise.
- Concern that businesses association members might react negatively if their association was seen as actively supporting a program that might add costs.

A survey of downtown businesses was drafted as a step to gauge business interest in OPD and aid in designing the program to work best. However, no business organization was in a position to assist in surveying its members (possibly due to concerns noted above). In addition, UTC did not have sufficient resources allocated to do the survey on its own. The draft survey can be found in Appendix 5.

Analysis of any OPD program is made more difficult because there is no existing database on when businesses take deliveries. However, it is certain that some off-peak deliveries happen now; truckers surveyed reported a quarter of their deliveries are in off-peak hours (as noted on page 18). Some businesses in the Loop, such as Target, take deliveries after hours. More data is needed, and a survey of businesses would be a good start.

B. Northwestern Memorial Hospital area east of North Michigan Avenue

The Northwestern Hospital area is characterized by dense business development, tight street layouts and heavy daytime traffic. As a practical response to this, progress has already been made on OPD in the Northwestern Hospital area. Logistics directors at Northwestern Memorial Hospital, Lurie Children's Hospital and Northwestern Medical School indicated that as much as two thirds of their deliveries are currently received at night; these are primarily bulk items such as linens, paper goods and food supplies.

There has been interest among the logistics directors in shifting more of the unscheduled daytime deliveries to off-peak times, but it is more complicated to accomplish because of the number and variety of businesses involved. Unscheduled daytime deliveries are made to medical offices and facilities, mostly by UPS and FedEx. Daytime deliveries are also made to the many retail and food businesses that operate through leases with Northwestern's real estate division. Those deliveries are neither tracked nor coordinated by hospital logistics staff.

One potential way to enable implementation of off peak delivery by the many smaller businesses throughout the Northwestern hospital area could be to establish a consolidated delivery station (discussed on page 18) on or near the hospital campus. This delivery station could be designed with security features to allow secure unstaffed deliveries throughout the

day or night. Deliveries could then be sorted and transported throughout the campus in a coordinated fashion.

The consolidated delivery concept need not be limited to the hospital campus alone but could potentially include nearby businesses. This idea merits further study. It is not a simple thing to set up, and should only be done if it can be reliable, cost-effective, improve delivery speed and reduce peak period street traffic.

There are several options for designing and implementing an OPD pilot program.

If it is determined to undertake a pilot OPD program, there are four general models for designing it.

1. New York City Approach –

Using grant funding as a financial incentive as in the New York pilot, seek out receivers in a particular corridor or area to implement off peak delivery on a trial basis.

2. One Large Receiver Approach –

Identify one large receiver to be a demonstration project. A major healthcare facility would have ideal scale and volume. This may or may not require a financial incentive; none was needed in Orlando.

3. Package Approach –

Piece together an attractive package of discounts and non-monetary incentives, such as:

- Financial incentives
- Public recognition through a coordinated program
- Direct discounts by carriers to receivers for off peak deliveries
- Coordinated participation by receiving businesses
- Discounted fees and charges from governments and supportive businesses.
- One-time funding for physical improvements such as storage lockers for unstaffed OPD or sound-reducing technologies (if funds are available).
- List of “Trusted Vendors” that certify certain safe and quiet delivery practices

4. Regulatory Approach – a local ordinance (as suggested on page 24) would create temporary regulations for a pilot project. London and Copenhagen have adopted regulations that are more permanent in nature.

Any of these approaches would need coordinated administration and publicity with an official website and marketing material.

The New York City pilot, with extensive research assistance by Renesselaer Polytechnic Institute, led to a permanent off-peak program. It focuses on unassisted OPD (see page 17) in retail and food sectors, including use of virtual cages, noise absorbing materials and low noise trucks, platforms and carts. Along with technology, a noise policy is being developed to ensure deliveries are quiet and not disruptive to local residents. The first layer of the policy includes commitment involving a code of conduct for both receivers and carriers to ensure health and safety and commitment to the community. The second layer includes training for driver behavior and low noise equipment. The final layer of the policy is enforcement by NYCDOT and NYCEPA to investigate violations and enforce compliance.^{xxxiii}

The permanent New York City program includes more than 400 participating businesses. In 2013, the USDOT, NYCDOT, and the Renesselaer Polytechnic Institute invited interested business owners to sign up for “NYC delieverEASE.” A \$2,000 financial incentive is offered to receivers. Participants include Sysco, Duane Reade, Dunkin Donuts, Beverage Works, and Waldorf Astoria. In total, 4% of the establishments in the accommodation and food sector in Manhattan are represented.^{xxxiv} To date, no noise complaints have been received.

If it is determined to implement an OPD pilot program, plan it carefully.

A. Create a leadership committee.

A leadership committee should be created with assigned responsibility and accountability. The committee should include interested and supportive business organizations, trucking firms, SINC, CMAP, CDOT, IDOT and other relevant organizations like Midwest Truckers, UI Labs-City Digital and World Business Chicago. Adequate staff should be assigned to plan and execute the program.

B. Learn and understand the needs and interests of carriers and receiving businesses.

Meet with key trucking firms such as UPS and FedEx. Seek involvement from trucking organizations such as Midwest Truckers and Illinois Trucking Association. Meet with business organizations such as the Chicago Loop Alliance and BOMA. Conduct surveys of businesses and carriers as needed.

Appendix 5 includes two draft surveys to gauge interest among businesses and carriers in participating in an OPD program, and to better understand their needs and delivery arrangements. As previously noted, the survey of businesses has not occurred, and the Midwest Truckers Association distributed a survey of truckers to its members and received some initial responses. It is important to understand the needs and operations of businesses and trucking firms in order to act most effectively to shift more deliveries to off-peak times.

C. Design the program for success. This will involve several types of decisions.

- 1) Determine type of OPD for each business and how to cover related costs, if any:

- a) Some businesses might have operating hours that would enable them to handle OPD without adding staff.
 - b) Some businesses might require staff to be present to handle off hours deliveries and those costs would need to be covered somehow.
 - c) Some businesses might be able to handle off hours deliveries without staff being present, but that might require investing in secure facilities and technology.
- 2) Identify the elements needed to gain participation by receivers or carriers – for example:
 - a) Recognition
 - b) Technology
 - c) Direct discounts from carriers
 - d) Subsidies
 - e) Local regulations
 - 3) Identify government actions that might help make OPD successful – for example:
 - a) Additional parking or cheaper parking for off hours deliveries
 - b) Easier access for deliveries during off hours
 - c) Access restrictions during peak periods
 - d) Tax credit or abatement
 - e) Other local regulations
 - 4) Determine administrative requirements and costs for the program.
 - a) Work plan and budget
 - b) Assignment of responsibilities
 - 5) Establish a practical plan to pay for the program – sources might include, for example:
 - a) Carriers – discounts to participating businesses, cover some project costs
 - b) Federal or State grants – e.g., USDOT, IDOT
 - c) Local funds – e.g., TIF districts, peak period parking fees or area access fees
 - d) Foundations
 - e) Sponsorships
 - 6) Determine program evaluation methods, set baseline data and appropriate measures of the project's results, and optimize scalability for the full program.
 - 7) Arrange publicity and communication including possible creation of an advisory group.

All of these decisions should be made with involvement of stakeholders and likely participants. Once these decisions have been made and a viable financial plan is in place, willing and suitable participants for the pilot would need to be engaged.

Conclusion

Although this project began with a desire to design and implement an off-peak delivery pilot program, the research and stakeholder responses led to a different result. So far, no source of adequate funds for OPD incentives has been found. No business organization has been identified that is currently in a position to sponsor an OPD incentive program. Further, although several public agencies have supported the concept of shifting more deliveries to off-peak times, none has made it an immediate priority.

Therefore, instead of this report serving as the basis for launching a pilot program now, it provides a foundation for future OPD efforts.

Findings and conclusions discussed in this report include:

- 1) OPD programs have been successfully implemented in several places around the world.
- 2) OPD can yield substantial benefits, but it can be challenging to implement.
- 3) The benefits and costs of OPD are not always evenly distributed. Carriers generally like the idea because it can save them time and money, but receiving businesses often resist it because it is inconvenient for them and can add costs. OPD offers broad public benefits from lessened congestion and improved air quality, but neighbors may have concerns about nighttime noise. An OPD program would need to be carefully designed to balance the benefits and costs to make it practical for carriers, receivers, shippers, customers and the community.
- 4) Some OPD is happening now, but better data is needed to understand its extent.
- 5) Further efforts should be made to shift deliveries to off-peak times. There are several ways that more OPD could happen in Chicago, including:
 - a) Launch a campaign to identify and publicly recognize businesses that are taking off-peak deliveries and encourage more to do it.
 - b) Offer businesses various incentives to shift receipt of deliveries to off-peak times.
 - c) Shippers and truckers (who can benefit from reduced costs of OPD) could offer favorable pricing to customers who shift receipt of deliveries to off-peak times.
 - d) Adopt transportation demand management strategies such as congestion pricing, supported by technology, to shift some traffic and reduce peak time congestion.
 - e) Consider regulatory measures to require certain types of businesses in congested areas to shift some deliveries to off-peak times.
 - f) As a first step, design and implement an off-peak delivery pilot program.

It is hoped that this research will be useful to others who wish to further consider and adopt practical and effective strategies to shift more deliveries to off-peak times.

Appendix 1: Literature Review and Case Studies

The longest running OPD program is PierPass OffPeak, a business-led not-for-profit that has been effectively used in Los Angeles since 2005. Other OPD programs in the U.S. have been implemented for brief periods; some in Europe – Spain, for example – have lasted longer. A few full-blown congestion pricing schemes that apply to all vehicles have been used in places like London, Stockholm and Singapore; it was briefly considered, but not implemented, in New York. Much has also been written about a pilot OPD project tested in New York City that achieved promising results.

Off-Peak Delivery Literature Review

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Introduction

The nature of urban freight problems stem from a variety of factors, including population and employment growth, globalization, customers' demand for an increased variety of products, the decentralization of logistics facilities and the increase of online shopping (Transportation Research Board, 2013). Due to these factors, deliveries likely represent more than 80% of the entire freight traffic in urban areas (Holguín-Veras et. al, 2010). There are numerous proposed interventions to the congestion, parking and circulation inefficiencies associated with the freight system. They include traffic management solutions such as access time restrictions, vehicle size restrictions, lane management and traffic signals and signs. Pricing and taxation solutions include freight road pricing, differentiated parking charges, and vehicle license fees that reflect externalities (Holguín-Veras J. , The Off Hour Deliveries NYC Project, 2011). Off-peak delivery is a type of traffic demand management intervention. Off-peak, or off-hour deliveries are those taking place between 7pm and 6am to avoid and lessen congestion. Off-peak delivery programs and policies can benefit peak hour travelers, the environment and the business community, and can enhance the economy and quality of life (Holguín-Veras & Hodge, 2013).

Holguín-Veras et al. (2014), explain that in order to achieve the economic efficiency, sustainability, and increased quality of life associated with OPD benefits, one needs to: "(1) understand behavior; (2) identify appropriate public sector policy measures; (3) identify the roles of the stakeholders in the execution of policy, and gain their cooperation; (4) assess the effectiveness of alternative policies; (5) identify pathways for implementation that account for the relative positions of the stakeholders; (6) test novel concepts; and (7) proceed to implementation, if appropriate."

Benefits

Holguín-Veras (Urban Freight Transport, 2013) defines the freight system as, "the conglomerate of all the economic entities involved in the generation, transportation, consumption and transformation of cargo." The catalyst for off-peak delivery programs is the inefficiency of the freight system, which involves producers, shippers, receivers, and carriers. Many trucking practices are efficient from the perspective of a private company, but they are inefficient from the lens of the entire system, due, in large part, to market forces. Specifically, surveys of the New York City freight system show that 25% of truck trips are empty and only 20% of the truck capacity is utilized (Holguín-Veras, 2013).

The off-peak delivery pilot program in New York City demonstrates specific ways this form of traffic demand management can benefit a wide variety of stakeholders. Pedestrians and cyclists experience an increased quality of life with less interference from deliveries, daytime non-freight travelers benefit from faster travel speeds, freight carriers see increased productivity, and receivers enjoy increased reliability (Holguín-Veras et al., 2014). Analysis of the pilot project results suggests that implementing long-term OPD policies in Manhattan would lead to travel time savings to all highway users of

approximately 3-5 minutes per trip. Carriers switching to the off-hours would save about 48 minutes per delivery tour and between 1 to three hours in service times for each tour (Holguín-Veras, Urban Freight Transport, 2013). In addition, there would be significant reductions in parking fines, which frequently exceed \$1,000 per truck per month (Holguín-Veras et. al, 2010).

Holguín-Veras et al. (2014) estimate that if fully funded, the NYC program could switch an excess of 20% of daytime freight traffic deliveries to the off-hours. Conducting off-hour deliveries is about 30% cheaper for carriers than delivering during regular hours. The total economic impact is estimated at \$150-\$200 million/year in economic benefits related to travel time savings, productivity increases and pollution reductions.

Stakeholder's Perceptions, Methods for Inclusion and Partnerships

Stakeholder collaboration is crucial to implementing OPD, because one single player cannot solve the entirety of freight issues alone, warn Holguín-Veras and Hodge (2013). The public sector regulates and manages infrastructure, the private sector operates the system, academia conducts research to find solutions and communities enjoy freight benefits but suffer from the impacts. The public sector may either prohibit OPD, remain laissez-faire, or mandate OPD. These radically different attitudes stem from the trade-offs between night noise and congestion reduction.

Holguín-Veras et al. (2014) cite many difficulties during the implementation process of the NYC pilot. For example, potential participants and stakeholder reactions ranged from a lack of interest to outright hostility during various stages. In the beginning, the attitude of most city agencies was that urban freight operation was a private sector activity and they should not interfere. Receivers did not see a reason to change their operations from regular-hour deliveries and carriers did not know how they would be able to compensate their receivers for extra costs, even though they stood to benefit from the program. These responses only represent a portion of each group, whether that is an individual company spokesperson or the leader of a trade group. Increasing the outreach process leads to a public sector that is more informed of the concerns and constraints of the private sector.

To foster a beneficial outreach process, Holguín-Veras et al. (2014) recommend:

- 1)** Designate one person at the key city agencies as the point of contact. He or she should have the authority to deal with freight issues. This person will be able to develop an understanding of OPD, get to know the key stakeholders, and be the point of contact for their agency.
- 2)** Create an Industry Advisory Group (IAG). An IAG is a discussion forum that meets several times a year, provides industry feedback to city agencies, as well as any updates on policies and programs. It is important that shippers, carriers, and receivers are involved to provide insight and expectations.
- 3)** Complement IAG input with targeted outreach efforts. As it is unlikely that many business managers will be able to attend every IAG, it is necessary to complement the input received by attending trade group meetings and arranging meetings with key companies to gather input directly.

Incentives

Holguín-Veras and Aros-Vera (2014) point to the foundation of what is now known as “road pricing,” laid down by Pigou in 1920. Pigou established that, “to reach the optimal level of production and consumption of a good or service, the externalities produced must be internalized by the economic agents involved in the activity.” Freight road pricing in competitive urban markets, however, does not follow this straightforward stimulus-response mechanism. In a simulation of NYC traffic, it was found that if peak-hour tolls were increased by about 40-50% at the bridges and tunnels that connect northern New Jersey to New York City, freight traffic did not respond by switching to the off-hours. Almost 70% of carriers said they could not change their behavior because “customer requirements” prevented it.

Cordon tolls (time of day pricing), according to Holguín-Veras (2011), are not very effective as a freight demand management tool; in his study of the Port Authority of New York and New Jersey, carriers enacted combinations of behavioral responses involving productivity increases, cost transfers, and changes in facility use. Around 40% of carriers responded by absorbing the toll increase by means of productivity increases. Only 9% of the carriers indicated that they were able to pass the toll cost to their customers, in most cases via a small increase in freight rates. This in turn eliminates the price signal required to incentivize receivers to change their behavior and accept OPD. Essentially, the customers, or receivers, don’t feel the impact of the increased tolls, so they have no incentive to change behavior. None of the carriers indicated changing facility use in isolation of the other behavior changes, which Holguín-Veras says indicates that cordon tolls are an inferior strategy.

Surveys and studies conducted by Holguín-Veras found, in essence, that financial incentives are most likely to influence the behavior of all receivers, which will in turn affect what carriers choose to do. Holguín-Veras and Aros-Vera (2014) describe in a number of cities such as London, Barcelona and Dublin, pilot tests without financial incentives have failed to “take root.” OPD in NYC grew beyond the pilot stage because it used incentives to convince the receivers to use the practice. However, in Barcelona, the one chain supermarket that tested OPD has since expanded its use to over 400 of its store locations throughout Spain (NICHES, 2010).

Therefore, Holguín-Veras and Aros-Vera (2014) use the NYC pilot project to exhibit the success of incentives to foster OPD. In this pilot, 24 receivers and 8 vendors used OPD for one month. Around half of the receivers used their staff to accept OPD, which used up most of the incentive to pay the staff. The other half allowed the vendors to have access to their establishment to deposit the OPD, so their staff did not need to be present and the incentive would become a net profit.

Self-Supported freight demand management system (SS-FDM)

According to Holguín-Veras and Aros-Vera (2014), a self-supported freight demand management system (SS-FDM) based on a toll-surcharge to vehicles that travel during regular hours could generate the funds required for a financial incentive and “continuing improvement towards sustainability.” The incentive to receivers to increase acceptance of off- hours delivery increases industry flexibility. Holguín-Veras and Aros-Vera (2014) explain if a sufficient number of receivers accept OPD and the carriers switch to the off-hours, there is a decrease in daytime congestion. The carriers benefit from

lower costs and increased productivity, the receivers experience increased reliability and benefit from the incentive provided and all people traveling during the daytime benefit from a reduction in congestion.

The toll surcharge does not need to be large, as its primary role, according to Holguín-Veras, is not to foster behavior change, although this increases the “political acceptability of the concept.” Holguín-Veras’ analysis of the New York pilot, specifically the unstaffed off-peak delivery (UOPD) found that receivers using UOPD stayed with the program after the incentives ended, exhibiting the idea that a gradual shift out of the regular hours would occur as multiple rounds of incentives reduce the number of daytime deliveries. The first round of the SS-FDM would generate incentives for a first set of receivers to use OPD, and if they are similar to the receivers in NYC, they will continue to operate in the same way. A second round of the SS-FDM would provide incentives to a second set of receivers, and so on. However, the receivers that were not initially inclined to participate will need larger incentives. With many iterations of the OPD incentive level increases, the welfare gains produced by the switch to the off-hours will not compensate for the welfare losses on the industry sectors that pay the tolls.

Holguín-Veras and Aros-Vera (2014) use the results obtained from the SS-FDM to show the various levels of incentives, the average market share of UOPD and the number of delivery tours and receivers that would be involved in UOPD produced by the simulation. The incentives in this model were funded solely from the freight traffic that crosses the bridges and tunnels in the NYC metropolitan area. The analyses showed that a SS-FDM supported solely by a toll surcharge on freight traffic would foster UOPD on a limited basis. It is estimated that a toll surcharge of \$1/axle could increase the participation by 2.4 %, while a \$2/axle surcharge would increase the participation by an additional 3.9 % during the implementation period of 3 years. However, applying a \$1 toll surcharge to the passenger cars that use the same bridges and tunnels, in addition to the toll surcharge in the range of \$1–2/axle to freight vehicles, could switch an excess of 13% of the truck traffic to the off-hours.

Optimal Incentives

In order to determine the right value of the financial incentive to carriers, Holguín-Veras and Aros-Vera (2014) points out two aspects of key features of freight supply and demand:

1. “The geographic location of establishments, as this determines delivery costs, and
2. The industry segment the receivers and carriers belong to, which influences the propensity to participate in OPD and parameters such as the number of delivery stops made.”

Holguín-Veras et al. (2010) found the optimal incentive for receivers to be \$10,000 per year. At this level, the economic benefits, measured in terms of benefits to carriers and benefits to road users, exceed the total incentive cost to receivers and maximize the net benefit. As the incentive grows, the costs increase at an accelerating pace due to the increasing incentive amount and the increasing number of establishments that take the incentive; the net benefit declines. Beyond an incentive of \$15,000/year to receivers, the total costs outweigh the benefits of OPD. In addition, he found that increasing OPD at large traffic generators has the potential to produce comparable economic benefits for a \$5,000 incentive to individual establishment receivers, at only a small fraction of the cost.

Behavioral Considerations

Holguín-Veras and Hodge (2013) stress the need to understand behavior to identify ways to induce OPD programs, which require the right combination of incentives and penalties. OPD policies must benefit all, or at least the majority of key players. For OPD to be implemented, both carriers and receivers must be better off. Holguín-Veras et al. (2014) recommend a few qualitative and quantitative data collection techniques for agencies or cities that wish to introduce OPD to better understand both why stakeholders choose to participate and the necessary incentives. Such techniques include in-depth interviews to gain insight from industry leaders, decision makers, and leading researchers, as well as focus groups to emphasize collective discussion. In addition to these techniques, behavioral surveys combined with discrete choice modeling can help to provide an understanding of how specific agents would respond to a given policy or program.

The Urban Gridlock Study introduced alternatives to reduce congestion in California's freeway system and the economic effects of such strategies. The study examined night shipping and receiving, specifically in large establishments and those that normally operate 16 to 24 hours per day. This study did not include compensation schemes for receivers. Therefore, it found that there would be an additional cost to shippers and receivers, result in modestly positive effects on traffic and congestion, and increase the cost of doing business in the California metropolitan areas studied. The study concluded that implementation of an off-peak delivery program would depend on state and local governments requiring shippers and receivers to change their delivery and operating schemes (Transportation Research Board, 1990).

Receiver Behavior

Behavior micro-simulations by Holguín-Veras and Aros-Vera (2014) provide important information on the willingness of receivers and carriers to participate. The model exhibits that if no incentive is provided, the probability that a receiver would participate is estimated to be between 4 and 5%. To assess the probability of participation, a random sample of receivers was presented with hypothetical policy incentive scenarios. The data shows that the greater number of deliveries an establishment receives, the less likely they are to participate in UOPD. Therefore, UOPD is attractive to urban area receivers who receive fewer deliveries on a daily basis. Holguín-Veras (2014) also explains that apart from financial-based policies (one-time incentives and carrier discounts), some non-monetary incentives such as public recognition and business support (with subjective values ranging from \$666 to \$1,885, and from \$1,078 to \$3,049, respectively), will help convince receivers to use UOPD.

Behavioral modeling suggests that the businesses most likely to be receptive of receiving off-peak deliveries are those that are open during off-hours anyway, such as restaurants, bars, convenience stores, 24-hour supermarkets and big-box retailers (FHWA Freight and Land Use Handbook, 2012).

Carrier Behavior

The behavior model completed by Holguín-Veras and Aros-Vera (2014) found that if all receivers in a delivery route want OPD, most carriers will comply because of the financial savings from decreased travel and service times and the extremely decreased likelihood of parking fines. It is estimated that off-

peak deliveries are 30-40% cheaper for carriers than regular daytime deliveries. However, if only a small amount of receivers are interested in OPD, the carrier may be unwilling to participate because of the additional cost associated with making two trips (one for receivers in the daytime and the others who participate in OPD). Holguín-Veras and Aros-Vera (2014) estimate the optimal level of participation in NYC as between 14-21% for staffed OPD and to exceed 40% for unassisted OPD.

Types of policies used in off-peak delivery

Holguín-Veras et al. (2014) explains that it is necessary to find a policy that is accepted and embraced by all stakeholders rather than an ideal policy that is opposed by the multiplicity of agents. Different types of OPD policies include:

Area wide policies

Area-wide policies attempt to foster off-peak deliveries at specific parts of the city. Holguín-Veras (2007) conducted surveys to consider two kinds of area wide policies: joint delivery service (JDS) and joint staging area (JSA). JDS aims to collect shipments from multiple carriers, consolidate those shipments, and deliver them to corresponding customers. It is of note that the larger the company size, based on the number of employees, the less likely to participate in JDS, most likely because of the difficulty in coordinating with others. Therefore, small carriers would likely find it easier to change their business practices and operations. The strongest likelihood to use the JDS is shown by food carriers. The joint staging area policy includes long-haul trips to staging area during off-hours with a space where off-hours trucks and drivers spend the night. Then the cargo is transferred to smaller trucks or transported directly during the day hours for local deliveries (Holguín-Veras, 2007).

Industry wide policies

Industry wide policies are those that target specific industry segments, e.g., tax incentives to restaurants in exchange for their commitment to do off-peak deliveries. Holguín-Veras (2007) explains that policies that target specific industries can include tax incentives to carriers and receivers of a specific type of commodity. A study modeled the joint decisions (receivers plus carriers) to estimate the market shares of off-peak deliveries. Scenarios included tax deductions and lower shipping costs for receivers, as well as designated street parking, pre-approved security clearance at bridges and tunnels, toll savings and financial rewards per mile traveled for carriers, only some of which correspond to public policy variables. The study found that providing tax deductions is the practical alternative that is in the hands of policy-makers.

Facility specific policies

Holguín-Veras et al. (2010) explain that facility specific policies aim to foster off-peak deliveries at specific locations, e.g. Grand Central Terminal in New York City. Large traffic generators include large buildings that contain many individual establishments and large establishments (those with more than 250 employees). Holguín-Veras (2007) found that large traffic generators probably represent the easiest implementation of off-peak deliveries, including a high pay-off in terms of truck trips and a cost effective implementation, as additional costs can be shared among different customers. Liability issues and

factors necessary to attract operators of large traffic generators to implement off-peak delivery must be researched.

Noise policies

Research by the NYCDOT suggests there must be multiple layers to OPD noise policies. The first layer, based on commitment, involves a code of conduct for drivers as well as low noise strategies and technologies. The second layer focuses on driver behavior, low cost measures and noise absorbing materials, and low noise trucks and equipment. The third layer is enforcement, which includes the DOT and EPA investigating violations and enforcing compliances (Holguín-Veras, 2013).

The Role of Technology in OPD

Noise Reduction

One of the largest concerns for some politicians and community members is the noise increase from night-time deliveries. Noise technologies include electric or alternative fuel trucks, low noise lift platforms, noise absorbing coatings and low noise carts (Holguín-Veras & Hodge, 2013). Innovative yet relatively simple measures include installing a power socket above the pavement in delivery areas so that a truck's refrigeration system can run without the engine, as they did at a McDonalds in France (NICHES, 2010). However, many of the noises associated with OPD are independent of vehicle operations, such as the handling of goods and the opening and closing of store doors. Therefore, training of drivers and ramp personnel is necessary (NICHES, 2010). The PIEK program in The Netherlands is the "Decree Retail Trade Environmental Protection," which sets noise emission level standards. The program focuses on the necessary technical adjustments to the means of transport, the materials used when loading and unloading goods, and the loading locations. A local legal framework aimed at noise reduction, along with an enforcement strategy, can be very helpful (NICHES, 2010).

GPS enabled cell phones

The NYC pilot's remote sensing component was completed with GPS enabled smartphones and turn-by-turn navigation software. The drivers were only required to turn the phones on at the beginning of each delivery tour, with no other interaction while driving to ensure safety. Some carriers already had GPS equipment for fleet monitoring purposes and elected to provide their data to the team. The information collected exhibited the travel speeds, both from the depot to the first customer as well as customer to customer, in addition to the time spent at each stop. Collecting data that focuses on customer to customer travel speeds shows not only the impact of freight delivery on urban congestion, but also the delays associated with making deliveries (Holguín-Veras, 2011).

Interactive Bus and Truck Maps

The District of Columbia offers an Interactive Truck and Bus Map so that carriers can familiarize themselves with D.C. prior to their trip. This includes finding the best routes, places to load and unload, and length of parking area. In 2013, the District Department of Transportation was awarded a grant from the USDOT to implement a three-year off-peak delivery program (D.C. Freight Bulletin). Although their Interactive Map appears to be directed toward easing daytime deliveries, similar technology could be used to increase further reliability and productivity of off-peak deliveries.

Virtual Cages

Virtual Cages are used to facilitate unassisted OPD and decrease liability concerns. Virtual cages are areas marked off by four sensors inside a store. The area is almost the full width and approximately half the depth of the store. The first level of access control is a security gate outside the store, which is brought up and down electronically by the turn of a key. An electronic keypad logs the start and end times of the delivery, in addition to the driver number. Once inside, the driver is restricted to the area marked off by the sensors. He or she brings the goods inside past the security tag detectors, which will set off an alarm if the boxes are brought back outside. The driver sorts the boxes and uses a handheld scanner, which connects to the specific retailer, to enter the goods automatically into the inventory system (Holguín-Veras & Hodges, 2013).

Off-Peak Delivery in Practice

Numerous experiments in off-peak delivery have occurred in the last 60 years. The 1960s London Experiment, also known as “Operation Moondrop,” resulted from the growth of traffic congestion and the rising cost of delayed deliveries. Various traffic control bans and time limitations on parking and loading, along with retailer’s preferences of delivery schedules, concentrated deliveries to three days a week within a five hour period. A six month off-hours pilot experiment in 1966 with 12 manufacturers resulted in increased travel and off-loading speeds, but proved to be uneconomical because of the costs of night time staff. A larger scheme in 1968 was unsuccessful because the level of operation was too low, resulting in under-used drivers, vehicles, and store staff as well as delivery costs more than 130% that of daytime costs (Collins & Pharoah, 1974). Holguín-Veras et al. (2005) suggest that this experiment could have been successful if trucking companies had scale economies and shippers and receivers perceived a real benefit.

In more recent years, OPD has begun to take hold in some European countries. In Barcelona, for example, a small pilot project that began in 2003 led to a chain of 407 supermarkets throughout the country utilizing off-peak delivery by 2010. With word spreading about its success, now other supermarket chains in Spain are exploring the concept (European Local Transport Information Service). In Dublin, the City partnered with the City Council, the local Business Association, distributors, retail chains, and developers to create suitable OPD policies. They began their efforts through a pilot project, which was followed by a program promoting low noise night deliveries and a subsequent Heavy Goods Vehicle cordon pricing program.

Olympic Games

Off-peak delivery was used as a strategy to manage unusually high levels of congestion during the 1984 Los Angeles Olympic Games, the 1996 Atlanta Olympic Games, and the 2012 London Olympic games. Although, OPD was part of a larger congestion management strategy in each of these cases, it was considered an important and successful piece of that strategy. In both Los Angeles and London, OPD was considered to be such a success during the Olympic games, local governments sought to promote continuation of OPD after the conclusion of the games (Southern California Association of Governments) (Transport for London).

Findings and Impacts of NYC OPD Pilot Project

In 2009, NYCDOT worked with the Rensselaer Polytechnic Institute (RPI) and a group of stakeholders and research partners to implement an Off-Hour Truck Delivery Pilot program in New York. The pilot included 35 receivers and 20 trucks/vendors. Participating companies included Foot Locker (ten stores), Whole Foods (four stores), and Sysco (twenty one stores). Half of the participants did staffed OPD and the other half did unassisted OPD, meaning the store provided the driver with a key or passcode. Receivers were given a financial incentive of \$2,000 for successful participation and carriers were given \$300 per truck participating in the pilot. According to Holguín-Veras', all participants reported being very satisfied with the experience during the pilot project. However, when the financial incentive was terminated at the end of the pilot, the receivers that used staffed OPD reverted their deliveries back to regular daytime hours. The receivers that did not use their staff for OPD stayed with the program, mainly because of the reliability of the delivery times. In regular delivery hours, many store managers must keep a safety inventory in case of shortages. With OPD, the supplies are waiting for them when they arrive in the morning (Holguín-Veras & Aros-Vera, 2014). Almost all the receivers doing unstaffed OPD remained in the off-hours. A managing partner at a food industry participant reported, "Our locations will continue to receive 'night drops' even though this program has ended as our managers now favor the dependability of night drops vs. late day time deliveries" (Holguín-Veras, 2013).

The impacts of success of the NYC pilot included that the Federal Highway Administration and the Environmental Protection agency provided \$450,000 in grants to small and medium sized cities to implement OPD programs. Both Orlando, Florida and Washington D.C. were awarded funding for OPD pilots. In addition, USDOT and RITA provided funds for larger implementation projects focusing on unassisted/unstaffed deliveries. This includes both the technologies and systems that enable UOPD and produce the same benefits as regular OPD at minimal cost, as well as addressing the liability concerns of receivers. Other funded projects focus on large traffic generators (Holguín-Veras, 2013).

The 2nd phase of the NYC OPD project, as Holguín-Veras & Hodge (2013) explain, focuses on the findings of the funded research efforts. Unassisted OPD behavioral research found the key financial determinants in OPD participation are one-time incentives and discounts from vendors. Vendor discounts include carriers providing shipping discounts when more vendors sign up for off-peak deliveries. The research again suggests that the public sector should provide incentives and public recognition to receivers, carriers and vendors should create shipping discounts, and trucking groups should start a "Trusted Vendor" program. Trusted vendor corresponds to characteristics of the receiver concerning whether they currently provide access to a vendor to do unattended off-hour deliveries (NYC DeliverEase Participant Packet).

NYCDOT Market Research reveals that it is pertinent to find signature chains to be the leaders in OPD programs. Once there is a clear plan with developed incentives, it is important to engage community stakeholders. If several key chain companies are on board and a business case is well defined, then it will be possible to win over resident and small businesses (Holguín-Veras & Hodge (2013). The lesson that is present throughout all of Holguín-Veras' publications is that engaging receivers is absolutely necessary to implementing OPD.

Off-Peak Delivery in the Private Sector

Not all off-peak delivery schemes have been conducted in the public sector. Wal-Mart Stores, Inc. was the leader in private sector off-peak delivery, moving at least 25,000 containers to off-hour delivery at the Los Angeles- Long Beach seaport in 2003. However, the company has since decreased the number of containers moved in off-peak delivery. Other importers to make similar large-scale commitments at the Los Angeles port include Target Corp., Payless Shoe Source Inc., Costco Wholesale Corp., Mitsubishi Corp., and Mattel Inc., (Holguín-Veras et al., 2005).

Orlando Health, a large healthcare provider in Central Florida, has initiated an off-peak delivery program on its Orlando campus. The healthcare provider is receiving no financial incentives, but moved to OPD in order to improve air quality, lessen congestion, and foster walkability on the campus and in the neighborhood.

Conclusion

Evidence shows that there are many benefits to implementing OPD in terms of faster travel speeds, increased productivity, more reliable deliveries, increased quality of life, and financial savings. Stakeholder input, particularly from receivers is crucial to establishing successful OPD. Input can be achieved through in depth interviews and focus groups. Financial incentives for receivers are a promising method to garner participation in OPD, although they are not always necessary; proven OPD may flourish without incentives or with non-monetary incentives, such as public recognition. OPD can be targeted to specific areas, industries, or facilities. Large traffic generators probably represent the easiest implementation of off-peak deliveries, including a high pay-off in terms of truck trips and a cost effective implementation. Noise emissions are one of the greatest public concerns to OPD, however, night delivery programs in Europe have demonstrated that with the proper standards and technologies in place, quiet nighttime deliveries can be achieved. Technological advances can also allow simple GPS tracking of OPD and unstaffed OPD, which is more likely to endure long-term. There has been growth in the practice of OPD in recent years, particularly in Europe in connection to nighttime noise reduction programs. The high profile success of the New York OPD pilot has led to greater interest in and funding by the USDOT to further promote OPD in urban areas in the United States.

Off-Peak Delivery Case Studies

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Summary

The following case studies of off-peak delivery (OPD) offer a number of insights into the potential creation and design of an OPD program.

Several OPD pilot projects have led to a longer term commitment to OPD. In Barcelona, for example, a small pilot project that began in 2003 led to a chain of 407 supermarkets throughout the country utilizing off-peak delivery by 2010. With word spreading about its success, now other supermarket chains in Spain are exploring the concept.

An OPD pilot project in New York City serves as a guide for future OPD pilots and also offers some important lessons learned. The New York implementers discovered the importance of engaging receivers in particular, but also other stakeholders in the freight community. They learned that receivers capable of accepting unstaffed deliveries are more likely to continue OPD long-term. They also learned the importance of finding the right level of incentives for participants.

The Washington D.C. Department of Transportation is using New York's experience as a model in designing its own pilot project, but customizing it to fit the District's needs and environment. OPD is one strategy that is part of the District's comprehensive freight plan, which includes many complementary programs.

Subsequent research from the New York implementers showed that certain types of businesses are particularly suited to OPD. Characteristics include large businesses that have the scale to make an impact, businesses in the retail, healthcare, and food service industries, and businesses that naturally have extended hours. Orlando Health is one such example. This central Florida hospital system decided to implement OPD of its own accord in order to ease congestion and make its campus a more sustainable, pedestrian-friendly environment.

Off-peak delivery was used as a strategy to manage unusually high levels of congestion during the 1984 Los Angeles Olympic Games, the 1996 Atlanta Olympic Games, and the 2012 London Olympic Games. Although, OPD was part of a larger congestion management strategy in each of these cases, it was considered an important and successful piece of that strategy. In both Los Angeles and London, OPD was considered to be such a success during the Olympic Games, local governments sought to promote continuation of OPD after the conclusion of the games.

One major concern about OPD is the level of sound created by nighttime deliveries. The PIEK program in the Netherlands has made great strides in promoting low noise emission delivery technologies through its certification program. Likewise, London has a Code of Practice for Quieter Out-of-Hours Deliveries that serves as a model to others.

Dublin provides an example of public policy intervention to expand OPD and reduce congestion. The City of Dublin partnered with the City Council, the local Business Association, distributors, retail chains, and developers to create suitable OPD policies. They began their efforts through a pilot project, which was followed by a program promoting low noise night deliveries and a subsequent Heavy Goods Vehicle cordon pricing program.

The PierPass OffPeak program demonstrates how an incentive-based OPD structure can be self-sustaining. PierPass charges a traffic mitigation fee for containers entering or exiting the Ports of Los Angeles and Long Beach during peak hours. These funds then pay for the additional off-peak shifts within the ports. The OffPeak program has diverted 30 million truck trips from weekday daytime traffic since the program began in 2005.

Atlanta Olympic Games

The 1996 Olympic Games in Atlanta created a major and sudden influx of traffic and congestion, as there were over 8.6 million ticket sales for the 17-day games. Due to the number of travelers who were unfamiliar with the region's roadways and an increased number of automobiles and pedestrian traffic, the transportation network was expected to have congestion levels throughout the day that would normally only occur during peak periods. Furthermore, urban freight demand was expected to rise with additional needs for deliveries to restaurants, hotels and tourist spots, which would raise freight demand and the need for additional trucks, add to congestion and decrease productivity.

In order to allow spectators and athletes to travel around the Atlanta area without extreme congestion, the region strongly encouraged off-peak delivery for all commercial vehicle-based pick-up and delivery services during the Olympics. An outreach campaign was conducted to encourage commercial vehicles to shift to off-peak hours or otherwise consolidate their deliveries. This temporary off-peak delivery program required the cooperation of groceries, retailers, distribution centers, and other private businesses. The shift to nighttime delivery was one aspect of regional transportation control measures which included updates to the MARTA public transit system, shuttle buses, HOV lanes and media campaigns that encouraged telecommuting or alternate travel times.

The implementation of off-peak delivery during the Olympics was one factor that contributed to modified daily traffic patterns. The Georgia Department of Transportation reported that usage of radial freeways (I-75, I-85, and I-20) went down 4-6%, the I-285 perimeter up 4-11%, and that peak traffic periods were more spread out than normal weekdays with peak flows up to 30% less than normal weekdays. Public transit ridership, which increased 217% during the Games, was responsible for much of the peak-hour traffic reduction.

During the daytime delivery ban many regional operational carriers used the same equipment during the day to support night time inter-city or interstate (over-the-road) operations between other markets. Therefore, many changes had to be made to workforce scheduling and equipment utilization outside the region and even the state. In addition, transit times between cities were affected, which disrupted supply chains. However, carriers responded to the changes in local and over-the-road operations by adopting temporary transit standards and corresponding temporary changes in the supply chain. UPS and FedEx changed their flight arrival and departure times to comply with restrictions.

Companies such as Coca Cola, with headquarters in Atlanta, realized productivity gains during the temporary off-peak delivery program when they found greater numbers of receivers and shippers available during hours with less congestion. Coca Cola believes that while roadway improvements can be helpful, no investment in the region would produce results comparable to off-peak delivery. With the interest of Coca Cola and members of the food and delivery industry, the possibility of an off-peak pilot program in one or two commercial areas is in discussion. The *Atlanta Regional Mobility Plan (2008)* noted that more than 60% of food distributors interviewed are willing to move to night deliveries "under the right circumstances."

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J. LaBelle and S. Frève, UIC Urban Transportation Center, August 15, 2016

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[Atlanta Regional Commission, Atlanta Regional Freight Mobility Plan](#)

Barcelona Night Time Delivery Initiative

The Barcelona night delivery initiative uses technologies to minimize the negative effects of delivery noise. Although Barcelona's program does not use financial incentives that may be necessary for implementation of OPD in Chicago, its noise reducing technologies and industry targeted approach provide valuable lessons.

In Spain, the supermarket and shop owners are responsible for the organization of transporting goods. They rent the trucks and manage the logistics process, and as a result they are also the driving force for the implementation of night delivery. From the shop owner's point of view, night time delivery is favorable because of faster driving times and the use of bigger vehicles at night which can reduce costs by consolidating goods.

The Barcelona night delivery project sprang from a broader effort known as the CIVITAS MIRACLES Project (Multi-Initiative for Rationalised Accessibility and Clean Livable Environments) which aimed to reduce transport-related environmental impacts at the local level, increase urban accessibility, enhance economic efficiency through better transport management, and improve citizen' quality of life in four European cities, including Barcelona. To achieve these goals the cities designed policy strategies and coordinated their implementation. Night delivery was one of the strategies. In Barcelona, the project stakeholders included the Barcelona Municipality Road and Traffic Department within the Civitas Miracles Project, the Mercadona supermarket chain, and members of AECOC, a Spanish suppliers and retailers association.

The Barcelona night delivery pilot project began in 2003 at two locations in the inner city area. The majority of receivers in Barcelona have only limited-stock holding capability and no off-street loading facilities. Freight operators were interested in delivering outside the Barcelona peak hours of 8am to 8pm. The pilot took place between 11pm-12am as well as 5am-6am on the street in front of a central supermarket. Instead of small vans going to a regional distribution center before making deliveries, larger 40 ton trucks delivered directly to grocery stores at night. During the pilot a small staff was present to accept the delivery.

The main objective of the pilot was to determine the feasibility of silent night deliveries in terms of social impacts as well as the return on investments for vehicle adaptations and night shifts. The noise reducing measures include carpeted flooring in the truck, low noise lifting system, and carriers with low-noise rubber wheels. The staff was trained to carry out deliveries in a way that minimized verbal communication and other noises. Mercadona estimates that full investment in vehicle adaptation is achievable within three years.

The pilot resulted in the ability of Mercadona supermarkets to substitute seven peak-hour deliveries using vans for two night-time deliveries using large 40 ton trucks. These deliveries were suited for supermarkets with a large capacity and substantial refrigeration facilities. Furthermore, measurements done by the police found that the noise level during loading and unloading were in line with regulations and differed very little from ambient conditions (an increase of 0.3 dBA). Nearby residents were asked about the noise directly after the delivery took place and no complaints were reported. Following this

success, Mercadona implemented a nationwide upscaling of the Barcelona pilot. By 2010, its Silent Nighttime Unloading Program was employed in 407 stores in 35 different provinces. They estimate that their vehicles spend up to four times less time in city centers, reducing congestion and noise pollution, and an overall reduction of 70,000 tons of CO₂ in 2010.

The Barcelona Municipality mobility Commission has now included three other supermarkets in their collaboration with Mercadona. The success of their trial has peaked interest in operators of smaller supermarkets to investigate similar noise-reducing measures, although some must use smaller 12 ton vehicles and different delivery patterns than Mercadona.

Sources:

[*Innovative Urban Transport Concepts, New and Innovative Concepts for Helping European Transport Sustainability \(NICHES\)*](#)

[*Loading and Delivery Management, San Francisco's Better Market Street Project*](#)

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[*Optimizing space for urban freight delivery, Bestufs Conference*](#)

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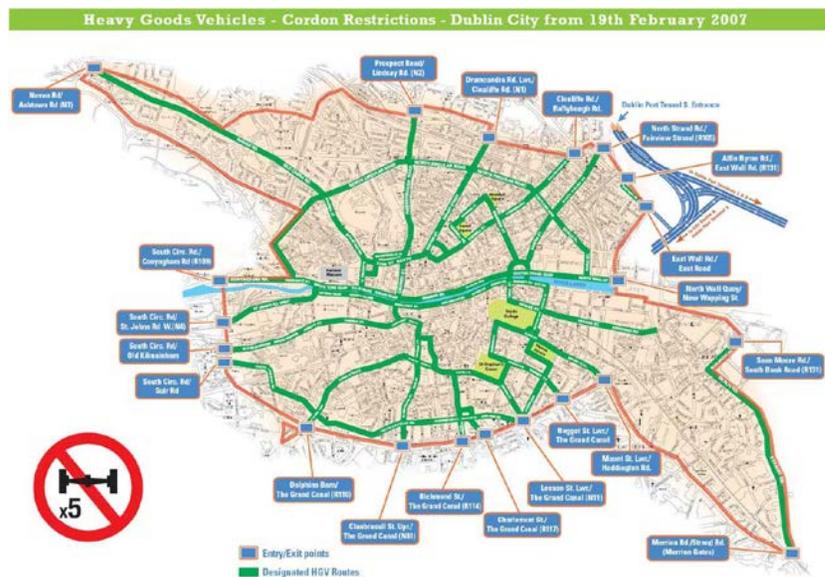
Dublin Pilot Project

The city of Dublin started a commercial vehicle pilot project in its city center in 2004, which included time-of-day restrictions on commercial deliveries and designated “clearways,” which prohibited on-street deliveries between 7-10am and 12:30-7pm. However, deliveries were allowed during those time in designated commercial vehicle parking areas and indented loading bays.

The pilot project was funded by the Department of Transport after extensive surveys on goods transport in the center city were carried out. Many deliveries were pushed to the early morning but the city reported that the restrictions caused many receivers to incur additional costs from providing staff in the early morning and coordinating off-hour deliveries.

After the pilot, a follow-up program was developed with goals related to bringing low noise, low cost products and system to the market to facilitate a more environmentally sustainable night delivery scheme. Similar to the Dutch Piek Programme, the Dublin program integrated roll cages, electric refrigeration, and silent tail gates, among other measures. In addition, the Dublin City Council implemented noise standards for the deliveries. The program involves the Dublin City Council, the Dublin City Centre Business Association, major distributors and retail chains, and property developers.

In 2006 the Dublin Port Tunnel opened to provide direct access between Dublin Port and the national road network for Heavy Goods Vehicles (HGVs). In order to minimize the use of the city streets by HGVs traveling to/from the Dublin Port, the city implemented HGV cordon pricing in 2007. The city also wanted to minimize conflict between the service requirements of businesses and the needs of other road users, and to manage HGV traffic whenever the Dublin Port Tunnel is closed. The HGV pricing scheme bans 5+ axle vehicles from a designated cordon area from 7am-7pm. The city provides a limited permit scheme (about 80 per day) for 5+ axle vehicles that need to unload/load within the city center, such as at construction sites. The HGV strategy reduced the number of 5+ axle vehicles within the city center by approximately 80-94%. In 2011, an estimated one-fourth of all food deliveries in Dublin occurred during off-peak hours.



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London Congestion Pricing and Overnight Deliveries for the 2012 Olympics

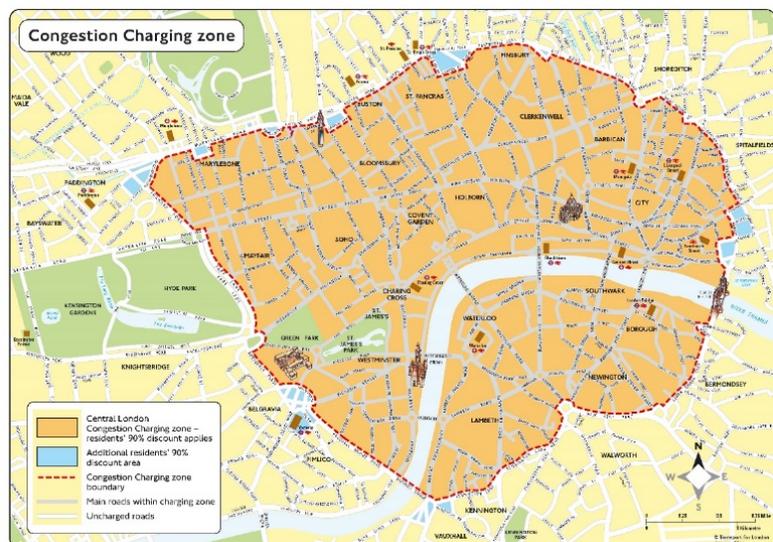
Congestion Pricing

Cordon pricing is used to control congestion by pricing access to urban centers and central business districts. London's cordon pricing scheme began in 2003 by Transport for London (TfL), the government body responsible for London's transport system. The monies raised from the pricing scheme are used to fund London's transport facilities.

Vehicles that drive within a 8 square mile zone of Central London between 7:00am to 6:00pm, Monday to Friday, pay a £11.50 daily (\$17.43 USD) Congestion Charge. There is no charge on weekends, public holidays, or off-peak hours between 6:00pm to 7:00am. The single payment allows users to enter, drive within, and exit the zone as many times as they want on that day. Residents who live within the charging zone are eligible for a 90% discount. Cars or vans which emit 75g/km or less of CO₂, as well as vehicles with nine or more seats, can receive a 100% discount. Drivers are charged through license plate recognition technology and have a variety of payment options, including an automated payment system, online, by text message, by phone, or by mail. The Congestion Charge was raised from £10 in 2014 for the first time in three years.

The impact of the congestion zone is dramatic, as there was a 33% reduction in cars entering the zone from before the program was implemented in 2002 to 2003 (200,000 to 125,000 cars). TfL reported that traffic levels on all types of vehicles in 2006 was 16% lower than the 2002 pre-congestion levels. The 2007 report also indicated that collection costs for the system (£130 million) were approximately 50% of revenues (£252 million). In 2007, the Congestion Charging zone was extended westwards

However, congestion zone revenues increased from £222 million in 2012/13 to £235 million in 2013/14, an increase which was driven by higher traffic volumes. In 2013 TfL explained that traffic speeds have also fallen in the last few years because of interventions that reduced the effective capacity of the road network for general traffic. Such interventions include policies to increase road safety and prioritize public transport, and pedestrian and bike traffic. However, other forms of transportation, such as the Tube, the bus, and biking, have increased since 2011.



2012 Olympics

The Congestion Charge remained the same during the 2012 Olympics. Transport initiatives for the Olympic Games included curbside controls, such as parking, waiting, and loading restrictions, which meant that delivery drivers were unable to deliver goods as they normally would. Transport for London established a code of practice to direct carriers how to make off-hour deliveries during the 2012 Olympic Games (See code of practice below). The purpose of the code, created in partnership with the Freight Transport Association and the Noise Abatement Society, was to help businesses and operators reduce disturbance for local residents. TfL provided general guidance including using newer and quieter equipment, ensuring all staff were briefed and trained, providing copies of the code to all suppliers and receivers, and liaising with the local borough. The code includes extensive directions for how the driver should minimize noise during deliveries.

Off-peak delivery

TfL notes that the Olympics code of practice still applies today, as it looks at how to minimize noise from off-hour deliveries, general guidance on planning deliveries, and tips for delivery drivers. Off-hour delivery trials in London will be completed by early 2015, as organized by the “Re-timing Deliveries Consortium.” The consortium is working within existing regulations to re-time deliveries to participating retailer’s stores.

Transport for London's Code of Practice for Quieter Out-of-Hours Deliveries

Background

The 2012 Games will have an impact on delivery and servicing activity across London this summer.

In many cases, owing to temporary restrictions, deliveries to shops, pubs, offices, hotels and restaurants will need to take place out of normal operating hours. In the most severely impacted locations the delivery may only be possible between midnight and 06:00.

This change will pose challenges to businesses, operators and London's boroughs. Although many deliveries already occur 'out-of-hours' without causing problems, the increase in activity necessary during the Games will mean even greater attention will need to be paid to meeting the needs of businesses while minimising disruption to local residents.

To help organisations deal with this change, Transport for London (TfL) has developed a code of practice for out-of-hours delivery, collection and servicing activity during the Games.

Purpose

This code of practice provides businesses and delivery companies with simple, practical guidance on how to minimise noise from night-time deliveries. It is relevant to all sectors and is in three parts:

- General guidance about what to consider
- Measures to reduce noise at the delivery point
- Measures for drivers

Businesses in London should ensure staff, suppliers and carriers are aware of any changes to delivery processes and the reasons for them. Copies of the code of practice should be sent to all parties likely to be servicing their premises during the Games. It is vital that drivers are briefed as they play a critical role in minimising noise. It is recommended that a laminated copy of the code's driver component is kept in vehicles used for deliveries.

The code covers best practice in minimising noise from delivery and servicing activity. However, each delivery point and type of delivery may have its own particular issues. It is important that these are reviewed and specific noise reduction measures introduced if required.

The effectiveness of this code of practice has been demonstrated in a series of out-of-hours delivery trials covering a variety of sectors across London. Case studies for these trials are available at tfl.gov.uk/2012outofhoursdeliveries

Businesses should also consider if there are restrictions such as planning conditions or noise nuisance issues at the delivery point that require a discussion with the local borough.

Where other considerations exist, businesses are urged to read the supporting information around Games time delivery solutions. This is available at tfl.gov.uk/2012freight

General guidance

Think about the potential noise impact of any out-of-hours activity on local residents, and review the likely sources and consider how to address these by:

- Using newer and quieter delivery vehicles and equipment, where possible
- Making sure all equipment – both on the vehicle and at the delivery point – is in good working order and maintained or modernised to minimise noise when in operation
- Ensuring all staff involved in delivery activity are briefed and trained appropriately, in accordance with the code of practice
- Ensuring all suppliers and carriers receive copies of the code and are aware of its importance
- Liaising with your local borough and contacting the Environmental Health Officer (responsible for noise issues) to explain the plans to manage night-time delivery and servicing activity
- Liaising with colleagues, other local businesses, suppliers and carriers to minimise the likelihood of more than one vehicle arriving at the same time

Ensure all drivers follow the guidance below

The delivery point

- Ensure delivery bay doors, gates and shutters are well maintained to minimise noise when opening and closing
- Switch off any external tannoy systems
- Avoid using external bells at delivery points
- Switch off the radio when delivery point doors are open
- Ensure the delivery point and surrounding areas are clear of obstructions so vehicles can manoeuvre easily
- Keep doors other than the delivery point closed to ensure noise does not escape
- Where possible, prepare all empty handling units, salvage and returns behind closed doors. Check they are in the correct condition and position and at the right height before taking them out. This will minimise outdoor activity and unnecessary noise
- Think about how to minimise contact between hard surfaces, particularly metal on metal, during the unloading/loading processes. For example, use rubber matting and buffering material on doors
- Service any delivery equipment in advance to minimise noise
- Make sure the delivery point is ready for the vehicle before it arrives – gates and doors should be open to avoid the vehicle idling
- Make sure the driver knows the precise location of your delivery point and is aware of any local access issues
- Ensure staff do not shout or whistle to get the attention of the driver

The driver

- Plan ahead to ensure you know the location of the delivery point and the appropriate access route
- If early for your delivery slot, do not wait near residential property and encourage the driver to switch off the engine
- As you approach the site and manoeuvre your vehicle into position, remain aware of the effect noise levels can have on local residents
- Do not sound your horn
- Reversing alarms should be switched off or modified for white noise, if not subject to health and safety requirements. Use a qualified banksman instead, if available
- Engines should be switched off immediately when not manoeuvring, however, try to minimise start-ups and avoid over-revving
- Refrigeration equipment should be switched off in advance of arrival at premises
- If the radio is on, ensure the cab windows are closed and switch the radio off before opening the door
- Minimise the frequency of opening and closing vehicle doors, and do so quietly
- Allow extra time if needed to unload as quietly as possible. Take particular care to minimise rattle from metal-on-metal contact when moving roll cages
- Where practical, notify staff at the delivery point in advance of arrival to ensure they are ready for you
- Be aware of how far your voice can carry when talking outside at night
- If opening a gate/cellar flap/roller shutter door to gain access, do so gently and as little as possible
- Lower flaps on tail-lifts carefully and quietly
- Do not whistle or shout to get the attention of store employees
- When moving gates, locks and load restraint bars ensure they are placed gently in their resting position/stowage point – do not drop or drag them on the ground
- When safe to do so, use sidelights rather than headlights while off-road and manoeuvring, to minimise light intrusion
- Minimise excessive air brake noise
- When working in the vehicle load space avoid banging cages into the vehicle walls
- When finished unloading/loading, close up the vehicle quietly
- For keg deliveries, ensure that dropping beds are always used when dropping kegs into and out of the vehicle. If rolling kegs to the delivery point, use rubber matting. Consider using a sack truck with pneumatic tyres to move kegs from the vehicle to the delivery point
- Show the same consideration when leaving the site as when arriving

Sources:

[Congestion Mitigation Commission Technical Analysis, Cambridge Systematics, Inc.](#)

[Transport for London, Congestion Charge](#)

[Transport for London, Retiming & out-of-hours deliveries](#)

[An Olympic Effort, Supply Chain Matters](#)

[The Royal Borough of Kensington and Chelsea](#)

Los Angeles Olympic Games

In anticipation of the 1984 Olympics, the city of Los Angeles implemented numerous temporary transportation control measures in order to reduce congestion and dangerous air pollution levels. On an average weekday in 1984, almost one-half of the 220 million vehicle miles traveled in the region were through trips on arterial roads, as opposed to short trips. Usually, jurisdictional boundaries and various enforcement agencies inhibit the implementation of actions to improve traffic flow on the arterials. For the Olympics, Caltrans worked with more than 50 governmental agencies and private transportation planners to implement the traffic management plan. The California Highway Patrol and Caltrans concentrated on freeway flow management strategies which included strict monitoring of access to freeways; closure of certain on-ramps; instant towing of disabled vehicles; bus-only on-ramps; motorist advisories; traffic signal system management; and intense surveillance using helicopters and closed-circuit television.

In addition, the plan included policy measures and practices such as increased carpooling and bus riding, movement of commuter traffic to off-peak hours, stronger street parking enforcement, asking employers to allow their employees to work from home, and encouraging a voluntary reduction in peak period truck deliveries. In this case, the peak period included the periods before, during, and after Olympics event, which differs from normal urban peak periods. The California Highway Patrol and the California Trucking Association negotiated a five-week labor contract waiver with the Teamsters Union. This allowed truckers in Southern California to switch their deliveries to the off-peak hours

The state of California enacted laws to allow off-peak delivery of certain commodities and implemented a public information campaign to educate the trucking industry on the necessity of altering delivery routes and activities. In addition, some businesses increased their inventory to reduce the need for deliveries during peak periods. As a result of the numerous transportation control measures, congestion was reduced by approximately 60% and truck traffic decreased by 16% during peak periods. Despite experiencing 11% more traffic on the freeways than pre-Olympic traffic volumes, there was considerably less congestion. In addition there was a 42% reduction in truck-related accidents during the Olympic period. Much of the success was attributed to the high degree of public awareness surrounding the traffic plan and the transportation system being in a state of readiness. In recent years, some California policymakers are looking to the 1984 Olympic plan to reduce current traffic congestion. However, there is no current publicized discussion of an off-peak pilot program.

Sources:

[Monitoring Trucks for Air Quality, Transportation Research Board](#)

[Transportation Policy Recommendations, Southern California Association of Governments](#)

Netherlands PIEK Program for Noise Emissions

The Netherlands PIEK program has fostered innovations in low-noise technologies and behaviors necessary for off-peak delivery. In 1998 the Dutch government set standards for noise emissions related to loading and unloading goods. The “Retail Trade and Craft Businesses Environmental Management Decree” issued by the government on October 1998 mandates the noise emission level for the delivery of goods, in particular from trucks, must remain within a noise emission standards set. Strict noise standards have since been regulated for the hours between 7pm to 7am. Specifically, noises from unloading and loading cannot exceed 65 dB(A) between 7pm to 11pm and 60 dB(A) between 11pm to 7am. The noise levels are measured from 7.5 meters from the sound source in order to ensure nearby residents are not disturbed by night deliveries.

However, research at that time showed most loading and unloading actions exceeded the 60 and 65 dB(A) noise standards. Therefore, the PIEK program was designed to implement projects for necessary technical adjustments to the means of transport, materials used, and loading/unloading locations. The long-term program focused on ten projects to reduce noise emissions:

- Transfer of knowledge to the companies involved on a general level;
- Stimulate quiet behavior;
- Create the optimal loading and unloading bay;
- Low noise trucks (up to 7,5 tons);
- Low noise trucks (over 7,5 tons);
- Low noise transport refrigeration system;
- Low noise take along forklift truck;
- Reduce noise of roll containers, pallet-trucks and hand pallet-trucks;
- Quiet shopping trolleys;
- Electric drive or electric hybrid drive



A Truck advertising quiet technologies.

These projects have resulted in innovations that ensure all components that were originally too noisy are now able to meet the PIEK noise standard of 60 dB(A). After the technologies were developed, a PIEK grant program was developed in 2004 to encourage purchases of the low-noise products. The manufacturers of these products can request the PIEK mark, a product certificate, to advertise their product to carriers and receivers.

In 2007 the PIEK program’s technologies were tested on a Dutch supermarket chain. Deliveries were made from a main distribution center to ten supermarkets in nine cities over a three month trial period. Noise complaints, local environment, greenhouse gas emissions, logistic improvement, and cost were monitored. With 1,000 deliveries completed, there was only one complaint about noise. The results included less noise and air emissions as well as cost savings related to capacity, congestion, and delivery speeds.



By 2010, PIEK was implemented in 50 cities with 1,400 quiet deliveries per week. PIEK certification standards have been adopted in England, France, Germany, Ireland and

J. LaBelle and S. Frève, UIC Urban Transportation Center, August 15, 2016

Belgium after similar delivery trials took place. As of 2015, the PIEK program continues to offer “environmental investment” subsidies for Dutch companies to use low-noise technologies.

Sources:

[*Innovative Urban Transport Concepts, New and Innovative Concepts for Helping European Transport Sustainability \(NICHES\)*](#)

[*PIEK International*](#)

[*PIEK Programme, Open Source for Mobile and Sustainable City\) \(OSMOSES\)*](#)

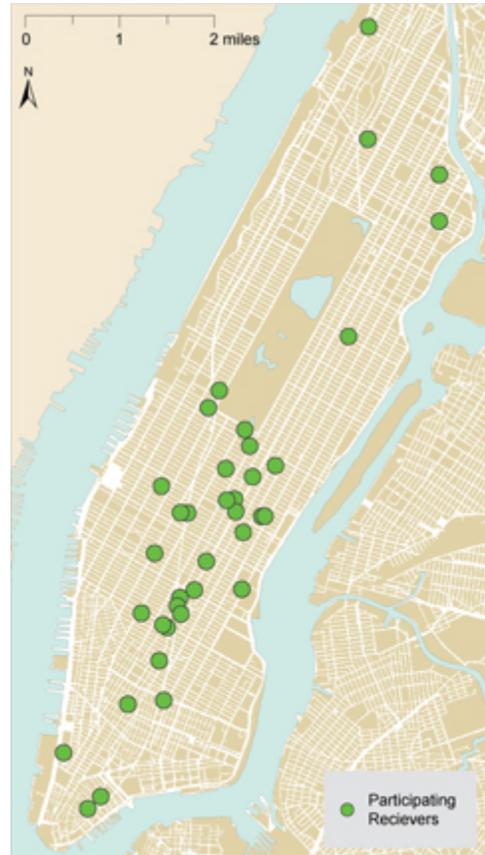
[*Low Noise Products, Goevaers Consultancy*](#)

New York City Pilot Project

Project Origin and Preliminary Research

In 2002 the Council of Logistics Management asked the New York State Department of Transportation (NYSDOT) to study how to foster off-peak delivery in New York City. From 2003 to 2005 the NYSDOT funded off-peak delivery research focused on Manhattan and later expanded the scope to Brooklyn. Since 2007, the USDOT's Commercial Remote Sensing and Spatial Technology program has funded an off-peak delivery pilot, which took place in 2009, as well as a current design and implementation phase. The NYCDOT considers off-peak deliveries as those taking place between 10PM and 6AM.

NYCDOT worked with the Rensselaer Polytechnic Institute (RPI) and a group of stakeholders and research partners to implement an Off-Hour Truck Delivery Pilot program from 2009 through 2010. The first phase of the pilot involved conducting behavioral and economic research on the most promising industry segments, the necessary incentives to receivers, GPS technology, and network models to assess local and network wide impacts. The total funding provided by the USDOT was about \$1.2 million and project partners provided an additional \$0.64 million. The pilot was initially delayed because of skepticism on the part of the freight industry and the challenge of not having any precedents.



Pilot Project

The pilot was implemented in 2009 in three separate one-month stages and included 35 receivers and 20 trucks/vendors. Participating companies included Foot Locker (ten stores), Whole Foods (four stores), and Sysco (twenty one stores). Half of the participants did staffed OPD and the other half did unassisted OPD, meaning the store provided the driver with a key or passcode. Receivers were given a financial incentive of \$2,000 for successful participation and carriers were given \$300 per truck participating in the pilot.

The NYC pilot's remote sensing component was completed with GPS enabled smartphones and turn-by-turn navigation software. The drivers were only required to turn the phones on at the beginning of each delivery tour, with no other interaction while driving to ensure safety. Some carriers already had GPS equipment for fleet monitoring purposes and elected to provide their data to the team. The information collected exhibited the travel speeds, both from the depot to the first customer as well as

customer to customer, in addition to the time spent at each stop. The average speed and service times of off-peak deliveries were two times and three times faster than regular hour deliveries, respectively.

Lessons Learned and Next Steps

Although satisfaction surveys from carriers/vendors, drivers and receivers were very positive, when the pilot ended all of the receivers doing staffed OPD reverted back to regular daytime deliveries. However, almost all of the receivers doing unassisted OPD remained in the off-hours because of its reliability. In regular delivery hours, many store managers must keep a safety inventory in case of shortages before deliveries are made. With OPD, the supplies are waiting for them when they arrive in the morning. A key lesson learned from the NYC pilot is that unassisted OPD works for large numbers of receivers and does not require ongoing incentives after the initial incentive.

Many of the lessons learned focus on accounting for self-interest when defining OPD policies so that they will not only benefit a vast majority of players, but will also last. Other lessons learned include the importance of stakeholder collaboration, since no single player can solve all freight issues alone. Industry advisory groups should be formed that include the public sector, associations, business improvement districts, the private sector, academia, and communities.

The most crucial finding from the NYC program is that engaging receivers is key to the strategy. Receivers create freight demand and specify delivery times. They are the customers of the freight system and greatly influence how the supply chain operates. Since they may be satisfied with the status quo, incentives are absolutely necessary to persuade them to participate in OPD. This can include a combination of one-time financial incentives, public recognition for outstanding service, or discounts from vendors for accepting OPD.

The current phase of OPD in NYC includes the design and future implementation of a permanent off-peak program. The program's design focuses on unassisted OPD at retail and food sectors, including technology such as virtual cages, noise absorbing materials, and low noise trucks, platforms and carts. Along with technology, a noise policy is being developed to ensure deliveries are quiet and not disruptive to local residents. The first layer of the policy includes commitment involving a code of conduct for both receivers and carriers to ensure their health and safety and commitment to the community. The second layer includes training for driver behavior and low noise equipment. The final layer of the policy is enforcement by NYCDOT and NYCEPA to investigate violations and enforce compliance.

A permanent program has yet to be implemented, although the NYCDOT is currently asking for interested participants. In 2013, the USDOT, NYCDOT, and the Rensselaer Polytechnic Institute invited interested business owners to sign up for "NYC deliverEASE." A \$2,000 financial incentive is offered to receivers.

J. LaBelle and S. Frève, UIC Urban Transportation Center, August 15, 2016

Sources:

[Urban Freight Transport: The Final Frontier, José Holguín-Veras](#)

[Lessons from NYC, VREF Center of Excellence for Sustainable Urban Freight Systems](#)

[Integrative Freight Demand Management in the New York City Metropolitan Area](#)

[NYC DeliverEase Participant Packet](#)

Stacey Hodge, NYC Department of Transportation

Orlando Health Pilot Project

Orlando Health, a large central Florida healthcare provider, is partnering with the Florida Department of Transportation (FDOT) to conduct an off-peak delivery pilot project on their Orlando campus south of Downtown. With funding from the Federal Highway Administration (FHWA), FDOT is studying the costs and benefits of moving peak period deliveries to off-peak hours. The off-peak pilot is being conducted in conjunction with a complementary pilot of the Freight Advanced Traveler System (FRATIS), which informs carriers of the best routes and times to make deliveries while avoiding peak congestion, construction, and traffic incidents.

Orlando Health is central Florida's fifth largest employer. Its main campus, located in an area known as "South of Downtown Orlando" (SODO) contains four main hospitals and includes additional medical offices, pharmacies, and services. Together, the campus has over 1,880 beds. Orlando Health employs nearly 17,000 staff and is associated with more than 2,500 physicians. Orlando Health will be opening a new 200-bed, 10-story hospital facility in the spring of 2015 which will be part of the existing 150,000 square foot Orlando Regional Medical Center.

Although Orlando has a reputation as a city that is not pedestrian-friendly, several neighborhoods in Orlando are becoming known for their walkability and bicycle-friendly amenities. SODO is one such neighborhood in transition. It contains a mix of dense single and multi-family residences, retail, and commercial space which includes a large destination shopping center. The Orlando Health campus faces an historic Amtrak station that is co-located with the new SunRail commuter rail service which began operations in 2014. Orlando Health has been renovating its campus to reroute and improve conditions for pedestrian and cyclist traffic.

The Orlando Health campus receives deliveries from more than 45 carriers and the health care provider also owns a fleet of trucks. Most deliveries arrive between 7 a.m. and 4 p.m. The loading docks are frequently congested and carriers are required to wait long periods of time or leave and return later in order to maintain their delivery schedules.

The off-peak delivery pilot project is part of a broader effort by both the public and private sectors to increase walkability, alleviate congestion, improve air quality, and prepare for projected traffic increases within SODO. Orlando Health recognized the many benefit to moving deliveries to off-peak periods, including:

- Maximization of their investment in existing infrastructure.
- Ability to offer more lines of business within existing infrastructure.
- Decrease in environmental impacts of less efficient freight operations, improving both air and water quality.
- Increased safety by separating transportation user groups (freight, bicycles, pedestrians, and passenger vehicles). Increased safety also reduces potential liabilities.
- Improved security during off-hours.
- Improved public image and marketability.

The pilot project has a \$298,000 budget (50% from the FHWA and 50% from FDOT), and a three year timeline, nine months of which will be active data collection. Baseline condition data will be collected, after which data will be collected by the FRATIS system as off-peak freight deliveries are implemented using the FRATIS scheduling system. Orlando Health will receive no direct financial incentives for the project; the project budget is dedicated primarily to project management, data collection, and analysis of the outcomes. Project results are expected in early 2016.

Source: Lori Sellars, Consultant, Florida Department of Transportation

PierPass OffPeak Program

PierPass uses pricing to reduce congestion and delay in a specific transportation corridor. While the Chicago freight system's complex multi-corridor layout could make it difficult to duplicate PierPass here, it is worth understanding the idea and considering how time of day pricing could produce similar benefits.

PierPass is a not-for-profit company created by marine terminal operators at the ports of Los Angeles and Long Beach, California to address multi-terminal issues such as congestion, security, and air quality. The company created a market-based incentive program called OffPeak. The program provides an incentive for cargo owners to move cargo at night and on weekends (off-peak shifts) to reduce truck traffic and pollution during peak daytime hours and to alleviate port congestion. PierPass is the only permanent off-peak program in the United States.

Beginning July 23, 2005, all international container terminals at the Los Angeles and Long Beach ports established five OffPeak shifts per week on nights and weekends.

- 6:00 p.m. to 3:00 a.m. Monday through Thursday
- 8:00 a.m. to 5:00 p.m. on Saturday

No fee is charged for containers entering or exiting the terminals during off-peak hours.

Containers entering or exiting the terminals by road during peak hours (3:00 a.m. to 6:00 p.m. Monday through Friday) are charged a Traffic Mitigation Fee (TMF). Since 2005, a Traffic Mitigation Fee has been assessed on all loaded containers entering or exiting marine terminal gates by road during peak daytime hours. The initial fee was \$40 per TEU (20-foot equivalent unit), or \$80 for all containers larger than 20 feet. In 2014, the fee is \$66.50 per twenty-foot container or \$133 per forty foot container. The fee is adjusted annually to reflect increases in labor costs based on maritime labor cost figures. There is no fee assessed for empty containers and chassis, domestic containers, or transshipment to other ports or on all traffic that is handled through the marine terminal gates during off-peak hours. Nor is there a fee for intermodal containers that depart or arrive via the Alameda Corridor for import or export, or that pay an ACTA (Alameda Corridor Transit Authority) fee. The beneficial cargo owners (shippers, consignees, or their agents) are responsible for the fee payment. The trucking community and water carriers are not responsible for the payment.

The TMF payments, minus PierPass expenses, are allocated by PierPass to the marine terminals to help offset their incremental costs to operate the extra shifts. The estimated annual cost to the terminal operators of operating the extra shifts is \$156 million to \$160 million.

The idea of PierPass began in the mid-1990s when Southern California port and elected officials discussed the increasing port-related impacts on surrounding communities such as traffic and air quality concerns. There were multiple off-peak pricing proposals that stalled over questions about who should pay for operating costs, the legality of measures designed to regulate international commerce, and the historic failure of past and current off-peak terminal operations to attract significant volumes of truck traffic.

In 2004, California Assemblyman Alan Lowenthal, proposed AB 2041 in the California Legislature. The bill proposed a “peak hour surcharge” for all containers that entered or exited a marine terminal in the port complex of Los Angeles and Long Beach between the hours of 8:00 a.m. and 5:00 p.m. Lowenthal promised to drop the legislation if a private sector solution could be found. The legislation would have imposed a tax on peak-hour moves, but offered little to relieve congestion. The Waterfront Coalition, an industry group composed of importers and exporters concerned about the vitality of Southern California ports, indicated that cargo interests would be willing to pay the costs of additional operations for a limited period of time if all terminals agreed to open during off-peak hours.

During this time, a group that included every Marine Terminal Operator engaged in international container handling in the ports of Los Angeles and Long Beach (MTOs) filed with the Federal Marine Commission (FMC) for formal recognition as the West Coast Marine Terminal Operators Agreement (WCMTOA). They were granted authority in late August and began discussing how to create a program that would encourage Beneficial Cargo Owners to move their traffic to and from the marine terminals during off-peak hours. The MTOs incorporated the Waterfront Coalition’s concept and agreed to open the ports for five additional off-peak shifts. After developing a comprehensive framework for the program, the MTOs filed an amended agreement with the FMC and announced the launch of PierPass. Jim Spinoza, president of the International Longshore and Warehouse Union (ILWU), announced the union’s support for the program and interest in working towards successful implementation. Assemblyman Lowenthal withdrew his bill at the end of August 2004.

The results of the OffPeak program have been impressive. Ten weeks after the start of the program, PierPass stated that they had exceeded their goal for the year in just 10 weeks. The initial goal was to shift 15-20% of all cargo movement to OffPeak by the end of the first full year of operation and 30-35% by the end of year two. In October 2005, PierPass claimed that the program had already shifted 30-35% of container cargo at all ports to OffPeak shifts on a typical day and by July 2008 that grew to 45%. As of 2014, the OffPeak program had diverted more than 30 million truck trips from peak to off-peak times since the program began in 2005. The FHWA forecasts predict containerized trade volumes through the ports to reach 42.5 million TEUs in the year 2030 alone.

In February 2007, PierPass released its third truck driver opinion survey. The survey reported 61% of truck drivers aware of the OffPeak rated it positively, over two-thirds reported both reduced traffic congestion (67%) and more flexible work schedules (66%) since the program began, 45% confirmed an overall increase in trips, and more drivers reported higher earnings since the May 2006 survey. As of 2014, 17,000 trucks visit the marine container terminals at the two ports on an average OffPeak weeknight. In the first half of 2014, the average amount of time it takes a truck to drop off or pick up a single container was 42 minutes. With an average 20 minutes in queue outside the terminals, a single transaction typically takes about one hour.

The thirteen terminals at the ports are members of the WCMTOA. There are a total of 20,000 registered shipping companies as of December 2014 (2.5 times as many as when the program began in 2005).

J. LaBelle and S. Frève, UIC Urban Transportation Center, August 15, 2016

Sources:

[PierPass OffPeak Program](#)

[Non-Toll Pricing, U.S. DOT, Federal Highway Administration](#)

[Congestion Mitigation Commission Technical Analysis, Cambridge Systematics, Inc.](#)

[PierPass News](#)

[Port Peak Pricing Program Evaluation, U.S. DOT, Federal Highway Administration, Cambridge Systematics, Inc.](#)

[Yahoo Finance](#)

Paul Sherer, PierPass OffPeak

Washington D.C. Corridor Pilot Project

In 2012 the Federal Highway Administration (FHWA) awarded the District of Columbia Department of Transportation (DDOT) a grant to conduct an off-peak delivery pilot program. DDOT is currently in the process of identifying receivers and delivery companies with whom they will partner to conduct the pilot project.

In its first step to undertake the pilot, DDOT conducted an analysis of business types and their deliveries in order to identify receivers and locations that would maximize the impact of OPD. With the help of researchers at Rensselaer Polytechnic Institute, DDOT studied the commodity flows and estimated the number of deliveries for each business. DDOT broke down these results in order to target corridors with mixed used development where delivery is challenging, double parking common, and curbside delivery is the only option available to businesses.

Following the initial analysis, DDOT began the process of identifying likely receivers. DDOT is using Business Improvement Districts and Advisory Neighborhood Commissions to facilitate this effort. DDOT plans to begin contacting potential receivers in early 2015. Once participants are identified, they will begin a period of baseline data collection prior to beginning OPD.

DDOT received \$150,000 from the FHWA and supplied a matching \$150,000 for a total project budget of \$300,000. This money is to be used, in part, for financial incentives for the receivers. DDOT plans to offer a list of options to facilitate off-peak deliveries. Options will range from hard infrastructure, such as storage lockers that will allow unstaffed deliveries, to employee costs for staffing off hour deliveries. The different options will receive varying financial incentives. Funding to begin OPD is expected to be dispensed by the fall of 2015.

Evaluation of results is expected to occur through pre and post pilot surveys and through analysis of GPS data collected during the pilot.

In the fall of 2014, the District of Columbia released a freight plan detailing freight challenges, projections, impacts, and obstacles, along with a strategic vision for the future. The plan lists twenty-five recommendations to improving the Washington D.C. freight system, including the pilot off-peak delivery program. Along with the OPD pilot, the District of Columbia Freight Plan recommended several complementary strategies to improving the movement and delivery of goods, including:

- Using bicycles for last mile delivery and pick-ups.
- Improving the existing loading zone program
- Conducting periodic truck freight stakeholder surveys
- Implementing dynamic truck routing and parking
- Establishing a formal Freight Advisory Committee

Source: Eulois Cleckley, Manager of State and Metropolitan Planning, District Department of Transportation

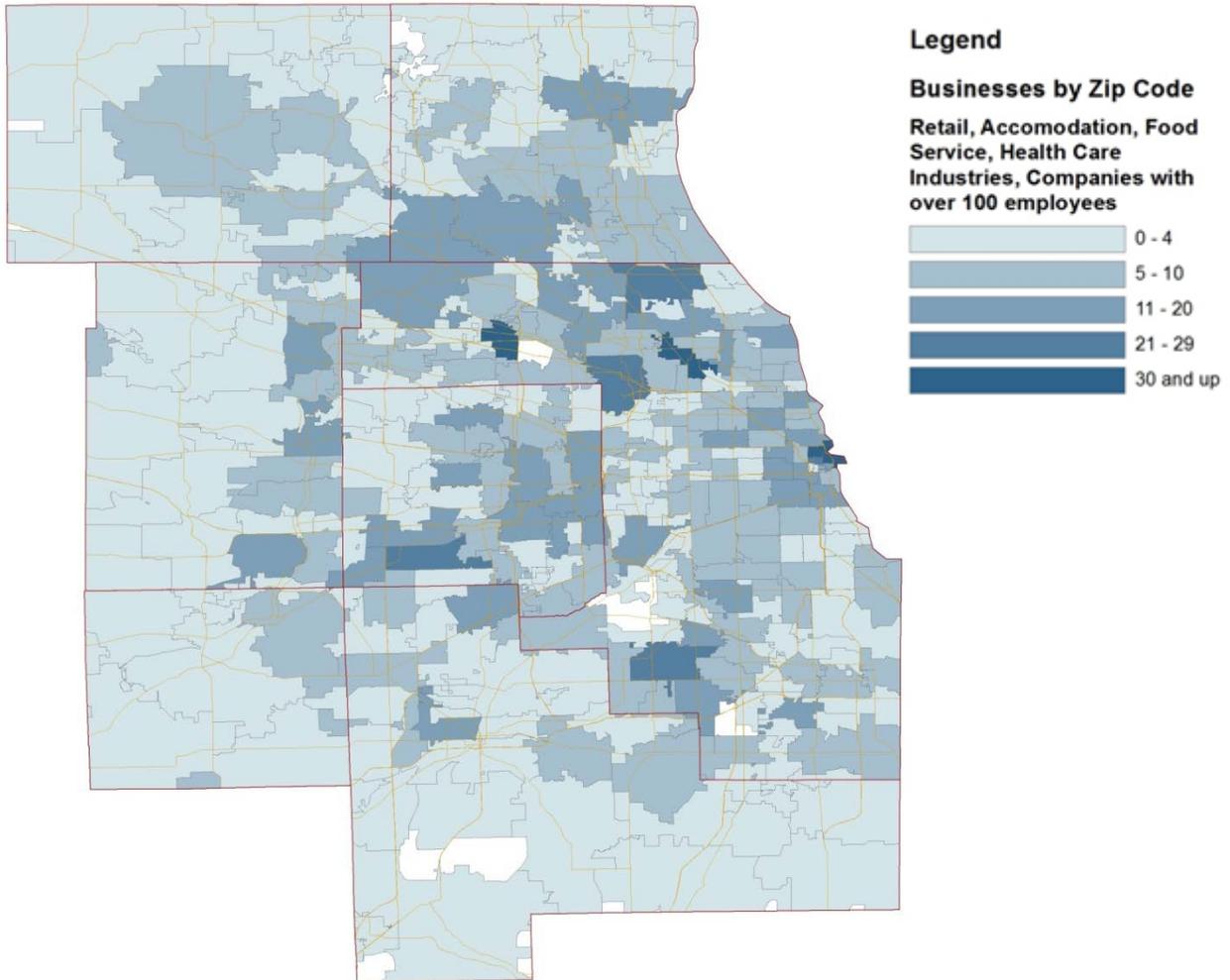
Appendix 2: Identifying Business Participants and Optimum Locations

An important step in designing a pilot OPD program is to identify businesses that would be most likely to participate, and compare their locations with maps of congestion. This involved several types of data collection and mapping:

1. Business locations from Census data, by zip code

First, using US Census data, the locations of businesses in industries likely to receive off-peak deliveries were mapped according to zip code. The industries selected included retail, accommodation, food service, and health care, as these businesses tend to have longer hours and a higher volume of deliveries. Only the larger businesses as measured by those with 100 employees or more were included.

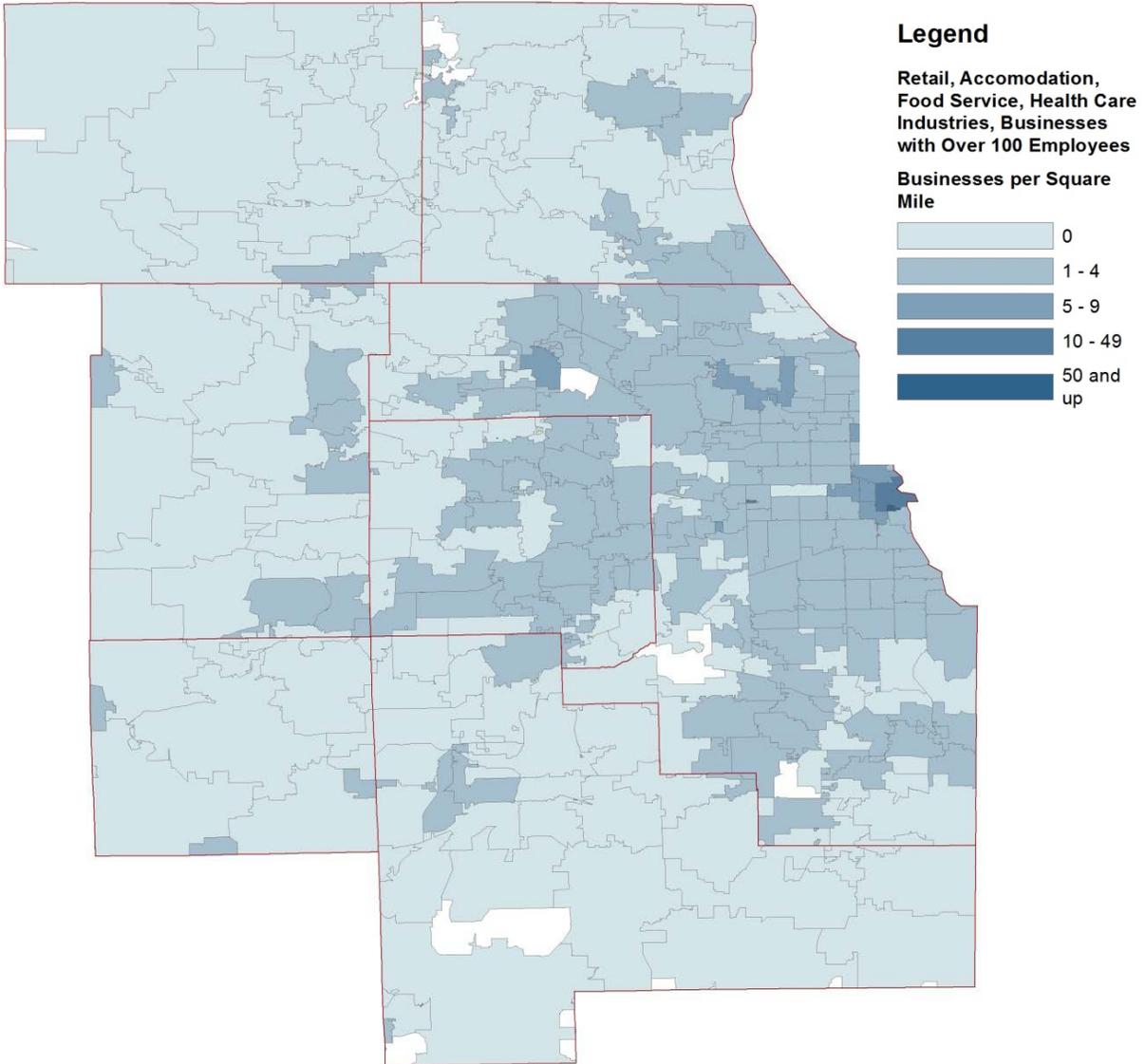
OPD Target Locations: Selected Industries, Companies with over 100 Employees by Zip Code



Source: U.S. Census Bureau, Illinois State Geological Survey

Zip codes vary greatly in size, so to control for that variation, the number of businesses per square mile was calculated for each zip code. This showed a concentration of likely participants in the area surrounding Chicago's central business district.

OPD Target Locations: Density of Selected Industries, Companies with Over 100 Employees by Zip Code

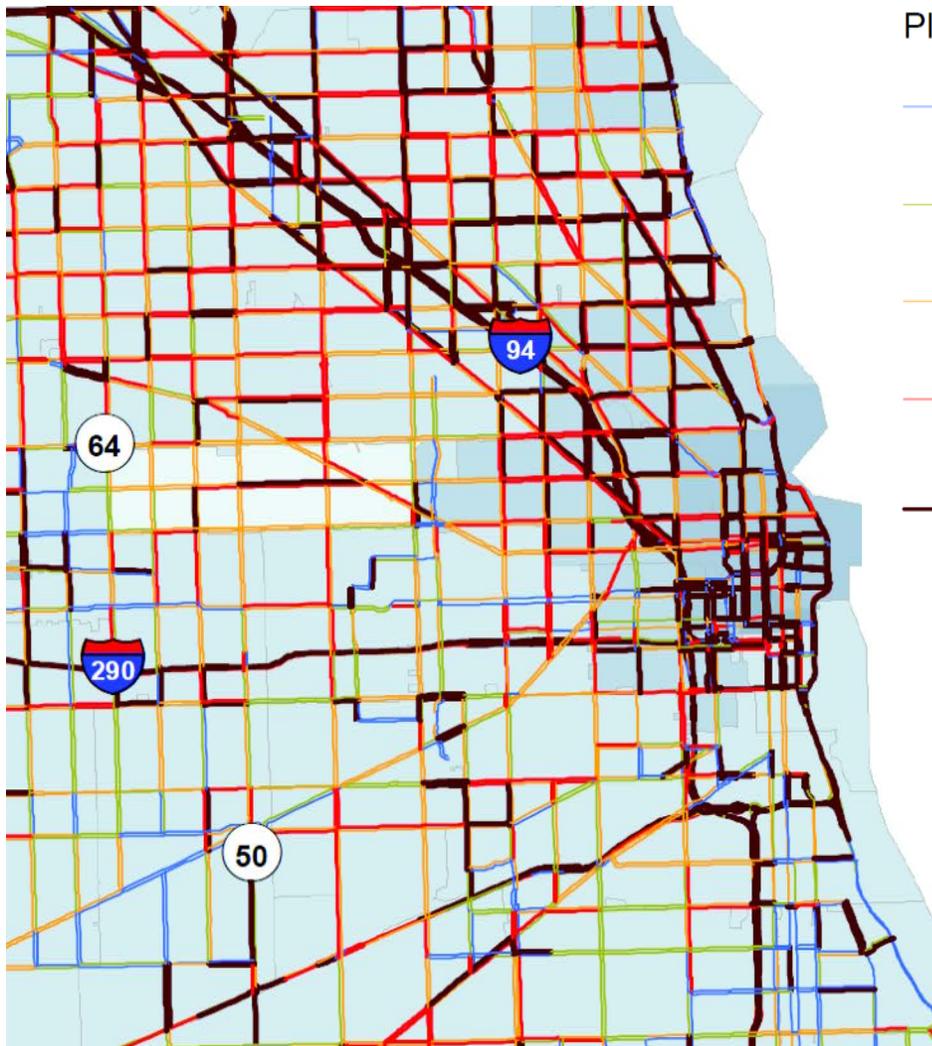


Source: U.S. Census Bureau, Illinois State Geological Survey

2. CMAP congestion data and maps

The maps demonstrating the density of businesses likely to successfully implement OPD were then compared to CMAP's congestion maps. OPD is meant to mitigate congestion and so should be implemented in areas where congestion is problematic. CMAP overlaid their Travel Time Reliability data onto the OPD Target Location Density map. The Travel Time Reliability data visualizes the planning time index, which is the ratio of peak travel time to free flow travel time. It is a measure of travel time reliability. The resulting map showed a prevalence of severely unreliable, very severe unreliability, and extremely unreliable routes in the zip codes more densely populated by businesses likely to engage in OPD.

Congestion: Travel Time Reliability



Highway Reliability, 2012: Planning Time Index

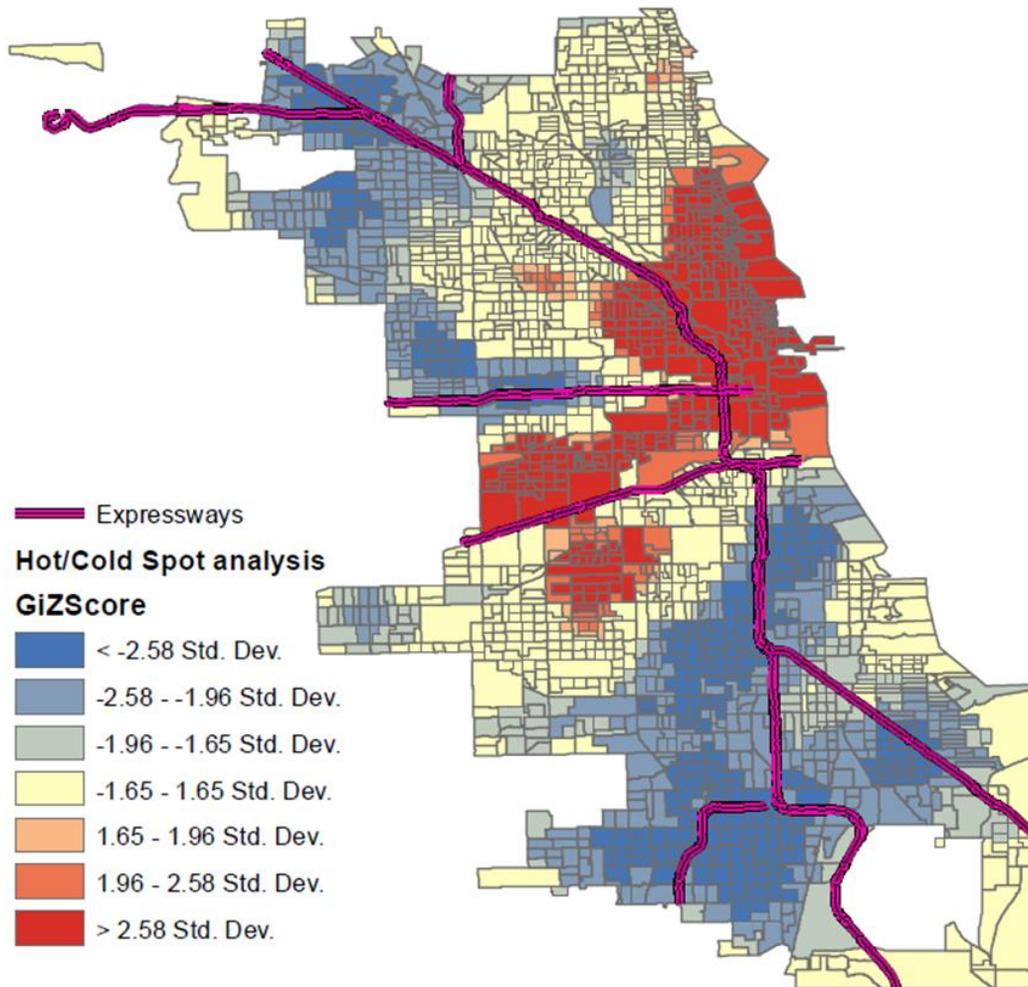
- Up to 1.40: Generally Reliable
- Up to 1.81: Moderately Unreliable
- Up to 2.55: Severely Unreliable
- Up to 3.35: Very Severe Unreliability
- Greater than 3.35: Extremely Unreliable

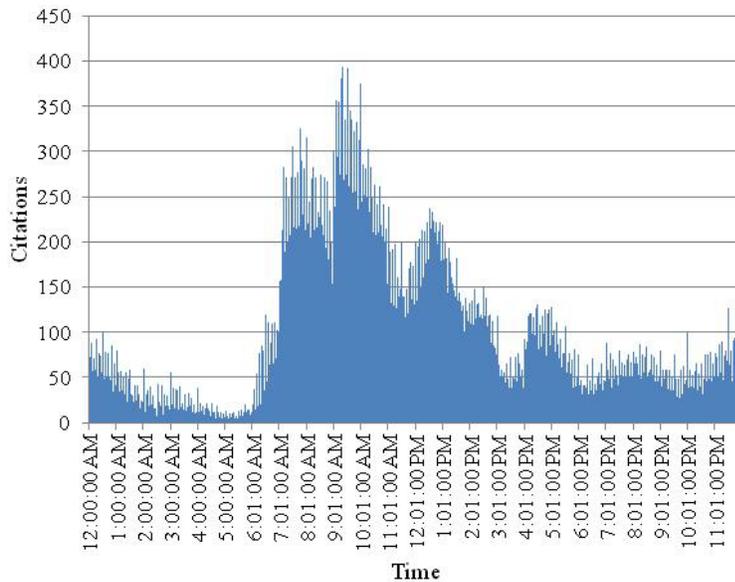
Sources: CMAP, Midwest Software Solutions, HERE, IDOT

3. Truck Citation Density Hot and Cold Spots, from *Analysis of Factors Affecting Truck Parking Violation Frequency in Urban Areas*, Kazuya Kawamura and P.S. Sriraj, UTC, 2014

Truck parking ticket violations can be used as a proxy to discern areas where truck deliveries contribute to congestion. An analysis by Kawamura and Sriraj on truck parking violations in urban areas showed truck parking violation hot spots in Chicago – areas where more trucks received tickets for parking violations. These hot spots cover Chicago’s central business district as well as portions of the city to the north and southwest of the central business district. The time of day of the ticket was also recorded, showing that the majority of the tickets occur between 7am and 6pm.

Parking Ticket Violation Hot Spots and Time Of Day





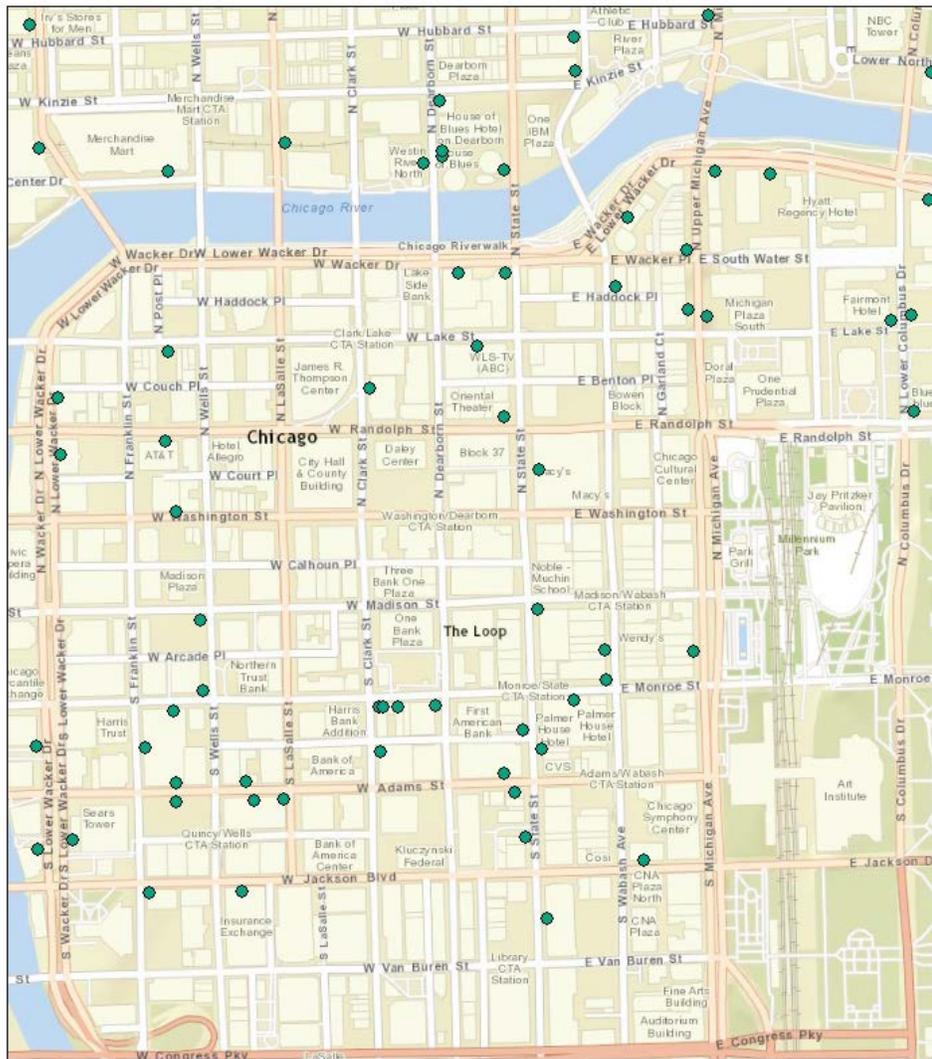
Prepared by: Kazuya Kawamura, P.S. Sriraj, Havan Raj Surat, Martin Menninger, College of Urban Planning and Public Affairs and Urban Transportation Center, UIC (Analysis of Factors Affecting Truck Parking Violation Frequency in Urban Areas)

4. Businesses more likely to participate in OPD

Within the zip codes with the highest density of prospective OPD receivers, businesses were then identified that could be favorable prospects for participation in an OPD program. These included previous OPD participants, such as Whole Foods and Foot Locker, members of partner organizations such as World Business Chicago, and businesses in specific industries well suited to OPD.

These businesses were grouped into two areas that appear to be promising possible locations for an OPD program: the Loop area of downtown Chicago and the North Michigan Avenue area.

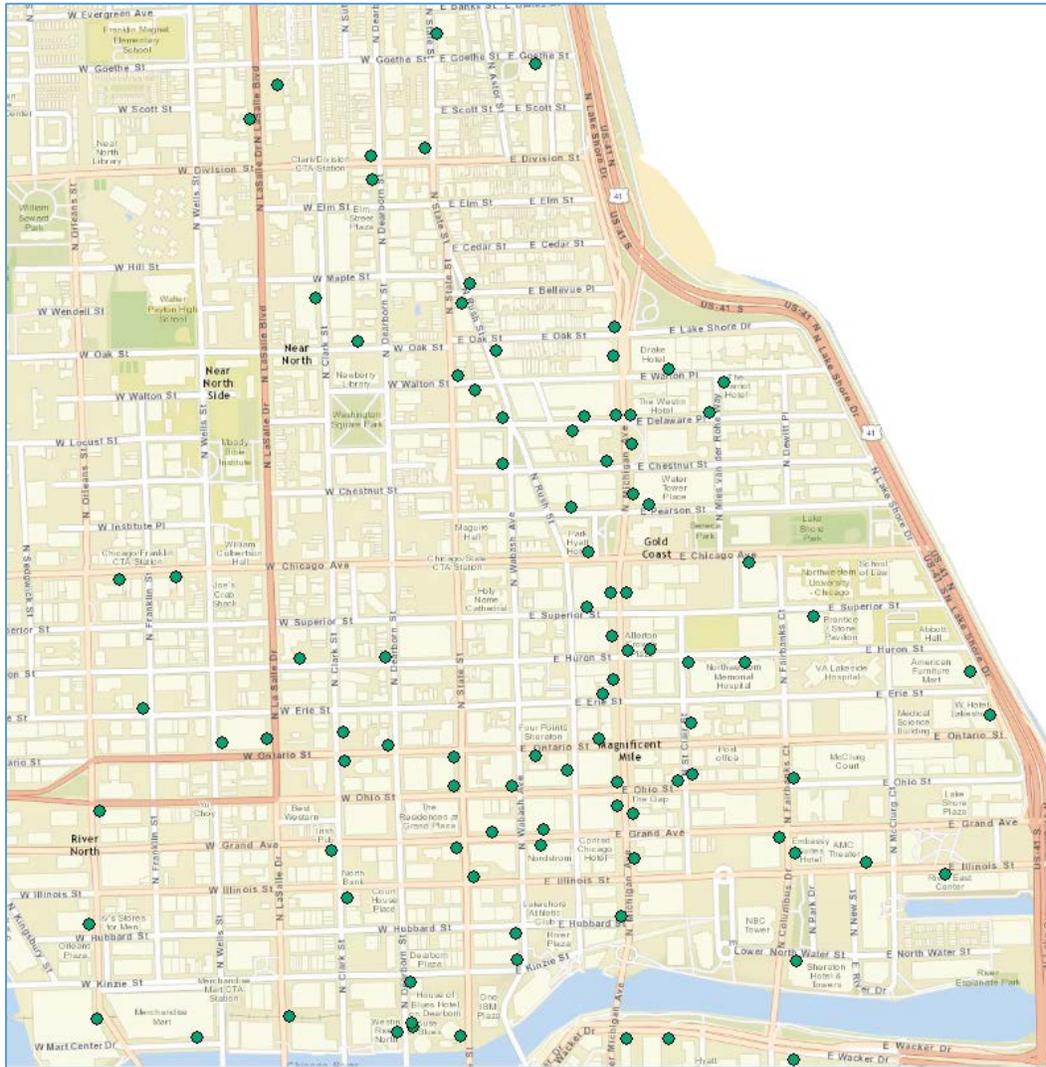
Loop Off-Peak Delivery Receiver Candidates



Source: Mergent Intellect

Service Layer Credits: Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

North Michigan Avenue Area Off-Peak Delivery Receiver Candidates



Source: Mergent Intellect

Service Layer Credits: Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Appendix 3: Summary of CMAP Survey Responses on Regulation of Overnight Deliveries

In the Chicago metropolitan area, regulations and restrictions that impact OPD vary by municipality. They can range from prohibitions on overnight deliveries to limitations on idling, noise, or exhaust. There is no centralized database of these restrictions in metropolitan Chicago. However, the Chicago Metropolitan Agency for Planning recently conducted a municipal survey which found the following:

Overnight deliveries are prohibited everywhere	12	7%
Prohibited in some areas or zones	27	16%
Regulated site-by-site through the development process	22	13%
Only nuisances (e.g., idling, noise, exhaust) are regulated	45	27%
No regulations	58	35%
Other (please describe)	4	2%
Total responses	167	100%

Source: CMAP

The “other” category included the use of portable scales, regulation through individual special uses, and regulation via business licenses.

The survey included questions on freight challenges which revealed that 46% of respondents – 70% when weighted by population – find delivery impacts during peak periods “somewhat of a challenge” or “more of a challenge.” Likewise, inadequate on-street loading zones were “somewhat” or “more of a challenge” for 49% of respondents.

Appendix 4: Excerpts from the 2008 Chicago Downtown Freight Study

Shipper Survey

Shippers representing a variety of freight services were identified and invited to participate in the survey. Shippers stated strong concerns about the availability of loading zones, having sufficient time in loading zones, and receiving parking citations. Several shippers suggested that a lack of available loading zones and dock facilities leads them to park illegally or block alleys. Shippers also expressed concern about limited dock access times and competition for dock space.

Truck Movements

According to truck count data, truck traffic volumes typically peak on downtown-area streets before 8:30 A.M., during the traditional morning rush hour. This creates competition for limited dock and loading zone spaces, resulting in truck congestion that impacts travel lanes. Most freight carriers prefer to leave the downtown area before 3 P.M. and there is no “typical” afternoon peak traffic period.

Research

Best Practices

The best practices of freight management services were examined in detail for six cities most similar to Chicago in size, age and population: New York, San Francisco, Seattle, London, Paris, and Barcelona. The table below lists some of the identified best practices with these and other cities in parentheses.

DELIVERY MOVEMENT ISSUE	BEST PRACTICE (City)
Building & Infrastructure Limitations	Retrofit incentives to improve loading facilities(NYC) Dedicated freight staff (Seattle) Spot infrastructure improvement program (Seattle) Freight movement obstacle inventory (Seattle) Truck route map with infrastructure limitations (SF)

<p>Loading Zone Management</p>	<p>Muni-meters for loading zones (NYC) Graduated loading zone pricing scheme (NYC) Metered loading zones (Seattle, SF) CCTV enforcement of parking and loading zones (London, Barcelona) Multiple-use travel lanes (Barcelona) Increased number of loading zones (Paris)</p>
<p>Peak Hour Delivery</p>	<p>Double parking fines in rush hours (SF) Recommended policy for off-hour deliveries (SF, Barcelona) Congestion pricing (London, Singapore) Peak hour access regulated by truck size (Paris) On-street parking area is loading zone before 10 AM (Boston)</p>

<p>Traffic and Truck Congestion</p>	<p>Truck route study (NYC) Capital improvement funds dedicated for freight-related improvements (Seattle) ITS to address congestion (Barcelona) HOT lanes (San Diego)</p>
<p>Multi-Modal Management</p>	<p>Regional freight plans (Various) Form a local freight management committee (Seattle) Freight Villages (Various) Alameda Freight Corridor (LA) CREATE (Chicago)</p>

Innovative Technologies

Many cities have made significant technology investments to improve freight delivery by making the most efficient use of existing infrastructure. Technology applications have been divided into two major categories:

Information exchange and infrastructure efficiency. Information exchange, such as network status updates and parking guidance, helps delivery drivers avoid congested areas or find open parking and loading facilities. Improvements in transportation infrastructure are accomplished through technologies such signal timing optimization, curb-side management and congestion pricing.

Recommendations

Over sixty potential recommendations were identified to improve the freight movements in the Central Area and divided into three categories: new building design standards and policies, use of the public right-of-way, and freight infrastructure recommendations. They were also divided into four groups for recommended implementation: immediate (0 - 3 years), shorter (3 - 5 years), long-term (5 - 10 years) and future (10 years or more due to high financial costs or needed improvements in technology). The following table describe the recommendations and proposed implementation schedule.

New Building Design Standards and Policies

New policies and practices for building design will improve site plan review to prevent insufficient dock facilities or dock access in design and construction.

	Recommended Implementation Timeline			
	IMMEDIATE	SHORT-TERM	LONG-TERM	FUTURE
Recommendation	Increase dock requirements in the Zoning Code	Promote a designated area for bicycle messenger parking	Increase dock requirements – use two dock sizes	None
	Refine standards that separate the dumpster area from loading docks; illustrate on site plans during review process	Modify dock requirements to take into account secondary uses such as stores and restaurants	Research freight elevator requirements for new buildings	
	Add a table with the dock requirements to site plans	Encourage the use of public elevators for parcel deliveries	Add “Downtown Office Building” land use category to off-street loading requirement table	
	Provide floor area ratio (FAR) bonus for inclusion of more than the minimum required loading dock facilities	Increase FAR bonus for below-grade dock facilities		
	Plan for 20-foot minimum alley widths for new developments			
	Require freight impact studies			

Use of the Public Right-of-Way

Policies, procedures or alterations to make streets, curb lanes, alleys, and loading zones more effective to support freight services and move freight shipments more efficiently.

Recommended Implementation Timeline				
IMMEDIATE		SHORT-TERM	LONG-TERM	FUTURE
Recommendation	Conduct enforcement program focused on noncommercial vehicles parked in dock areas	Distribute promotional materials to buildings with “where to call” information	Initiate a loading zone reservation system	Consider Eco-Loading Zones for low emission delivery vehicles
	Install new loading zone signage to clarify that their use is for commercial vehicles only	Designate areas with on-street parking as loading zones before 9 or 10 AM	Increase parking violation fines for commercial vehicles	Investigate streets where center lanes can be used for deliveries
	Install new truck route signage to Lower Wacker Drive	Use metered freight loading zones (LZs) with graduated fees	Enforce parking violations via remote cameras	Initiate a pilot program of dynamic curb-lane usage via electronic signage
	Initiate an alley obstruction enforcement campaign			Work with shippers to encourage drivers to pay parking tickets
	Conduct a commercial loading zone inventory and develop a comprehensive loading zone (LZ) plan			Install parking guidance systems (parking space availability signage)
	Improve signal timing in the downtown			Initiate a study to investigate congestion

				pricing
	<p>Increase parking violation fines during rush hour for obstructing loading zones or through lanes</p> <p>Raise loading zone fees</p>			<p>Create a City of Chicago license or placard for commercial vehicles to permit parking in loading zones and loading docks</p> <p>Employ three types of loading zones: generic, large truck, and commercial vehicle</p>

Freight Infrastructure Recommendations

Freight infrastructure recommendations include methods and procedures to improve freight capacity at existing buildings with delivery management policies, address freight hot spots, and coordinate with CDOT to address freight issues.

Recommended Implementation Timeline						
IMMEDIATE		SHORT-TERM		LONG-TERM	FUTURE	
Recommendation	Regularly update commercial loading zone information in the CDOT GIS database		Establish a pilot program with building managers/owners and shippers to remove dock obstacles (personal vehicles, in particular)		Use ITS variable message signage to allow drivers to avoid congestion before they enter the city or CBD	Promote the use of surface parking lots for delivery vehicle parking during AM and PM peak delivery hours
	Establish freight point person at CDOT		Initiate a freight obstacle database & spot hazard improvement program		Encourage contractors to park in parking lots (not alleys)	Encourage new buildings along streets with lower level access to plat lower level public ROW
	Determine legal status of City to ticket noncommercial vehicles in loading berths		Initiate a ban of trucks in designated areas for limited time periods		Establish a retrofit incentive program	Encourage web based loading dock reservation system
	Fine buildings that permit passenger vehicle parking in loading dock areas		Remove on-street parking on Wells / Lake / Wabash / Van Buren for loading zones		Perform a study of truck movements	Encourage multiparcel shared access to lower level parking & freight facilities
	Develop on-line one-stop freight information shop with maps and regulation information		Improve loading zone enforcement			Encourage delivery companies to buy or lease parking in surface parking lots
			Utilize vacant lots as temporary truck parking			
Encourage off-peak deliveries						

	Convene a freight committee at the city level	
	Conduct a regional freight plan / regional goods movement study	
	Add loading zones in "hot spot" areas	
	Create an Incident Alert System	
	Publish and distribute "Transportation Guide" or "Truckers Guide"	

Appendix 5: Draft Survey Questions to Carriers and Receivers

Sample of Questions to Receivers

The Urban Transportation Center at the University of Illinois is partnering with the Supply Chain Innovation Network of Chicago (SINC), a freight business organization created by World Business Chicago, to establish an Off Peak Delivery program in Chicago. Off Peak Delivery (OPD) is the practice of shifting deliveries to the off hours - typically between 7pm and 6am - in order to ease congestion, reduce costs, increase reliability, and improve the environment for businesses and their patrons.

The following brief survey is designed to gather information and gauge the interest and suitability of potential participants in an OPD pilot project in Chicago.

All responses are confidential.

Thank you for your participation!

Please fill in the following information.

Name

Title

Company

Address

Postal Code

Phone number

Email address

Who schedules and manages deliveries for your company?

Name

Contact Information

What are your normal business hours?

How many deliveries do you typically receive each day?

When do your deliveries typically arrive? (Check all that apply.)

- 6am to 10am
- 10am to 3pm
- 3pm to 7pm
- 7pm to 6am

How are deliveries to your facility typically made? (Check all that apply.)

- Attached loading dock
- Alley access
- Back door or side door
- Front door
- Other, please explain below.
- I don't know

In a typical week, from how many sources do you receive deliveries?

- one to four
- five to nine
- ten to nineteen
- twenty or more

Do you receive deliveries from your organization's proprietary warehouses?

- Yes, all or most of my deliveries come from proprietary warehouses.
- Yes, some of my deliveries come from proprietary warehouses.
- No, none of my deliveries come from proprietary warehouses.

Please list the following information, if known, pertaining to the carriers that deliver the highest volume of goods to your facility.

Carrier Name	Delivery Frequency	Time of Delivery	Size of Truck
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

How easy or difficult would it be to shift receipt of all or some of your deliveries to off peak hours (7pm to 6am)?

Very Easy Easy Somewhat Easy Neutral Somewhat Difficult Difficult Very Difficult

If you answered "somewhat difficult", "difficult", or "very difficult" to the question above, please explain your primary concerns in accepting deliveries from 7pm to 6am.

How much of a discount on your freight delivery costs would prompt you to shift receipt of your deliveries to 7pm to 6am? (Check all that apply.)

- My deliveries already occur from 7pm to 6am
- I would not need a discount
- 10% discount
- 20% discount
- 30% discount or more
- No discount would prompt me to shift receipt of my deliveries from 7pm to 6am

Are there incentives other than discounted delivery costs that might prompt you to shift receipt of your deliveries to 7pm to 6am? (Check all that apply.)

- Public recognition
- Tax credit
- Cash incentive
- Other, please explain below.
- No

Would you be willing to accept deliveries from 7pm to 6am when your staff is not present to receive them? (Check all that apply.)

- Yes, I can accept unstaffed deliveries with no changes to facilities or policies.
- Yes, if the carrier agreed to a certain code of conduct.
- Yes, if certain physical changes were made to create a secure delivery area.
- Maybe, if the circumstances were right.
- No, I would not accept unstaffed deliveries.

Please explain your response to the previous question.

Would you be interested in participating in an Off Peak Delivery pilot project in which some or all of your deliveries were shifted to the hours between 7pm and 6am?

- Yes
- I may be interested and would like more information
- No
- Other, please explain below.

Do you know of a business or businesses that might want to participate in an Off Peak Delivery pilot project? If so, please include the company, contact name, phone number, and email address below. You can also feel free to forward them the link to this survey.

Do you have any comments you would like to share with us?

Sample of Questions to Carriers

The Urban Transportation Center at the University of Illinois is partnering with the Mid-West Truckers Association to explore the possibility of establishing an Off Peak Delivery Pilot Project in Chicago. Off Peak Delivery (OPD) is the practice of shifting deliveries to the off hours - typically between 7pm and 6am - in order to ease congestion, reduce costs, increase reliability, and improve the environment for businesses and their patrons.

The purpose of the brief survey that follows is to gather information and gauge the interest and suitability of potential participants in this pilot project.

All responses are confidential.

Thank you for your participation!

Please fill in the following information.

Name

Title

Company

Address 1

Address 2

City

State

Postal Code

Phone number

Email address

To what locations within the Chicago region do you deliver? (Check all that apply.)

- Chicago Loop
- North Michigan Avenue/Streeterville area
- Other Chicago neighborhoods
- Chicago suburbs

When do you typically make deliveries? (Check all that apply.)

- 6am to 10am
- 10am to 3pm
- 3pm to 7pm
- 7pm to 6am

Please answer the following questions regarding a typical delivery tour.

How many stops are made on a typical delivery tour?

How much service time is typically spent at each stop?

Where do your trucks typically park when making deliveries? (Check all that apply.)

- Loading docks
- In the alley
- On the street in a loading zone
- On the street, but not in a loading zone
- Other, please specify below.

What types of truck do you use for deliveries in the Chicago area?

What would you estimate you spend on paying parking ticket costs for an average truck each month?

\$ 0 Per month

If the receiver was willing, how easy or difficult would it be to make deliveries during off peak hours (7pm to 6am)?

- Very Easy Easy Somewhat Easy Neutral Somewhat Difficult Difficult Very Difficult
-

If you answered "somewhat difficult", "difficult", or "very difficult" to the question above, please explain your primary concerns in making deliveries from 7pm to 6am.

In New York City, carriers reported that deliveries taking place between 7pm and 6am were 30-40% cheaper than daytime hour deliveries. Is this consistent with your experience in the Chicago area?

If tolls were lowered during off peak periods on area toll roads, would you shift some of your deliveries to off peak times to receive the lower rate? Please explain your answer.

Yes. Please explain below.

No. Please explain below.

It depends. Please explain below.

How much of a discount would you be willing to give receivers who moved receipt of their deliveries to 7pm to 6am? (Check all that apply.)

I would not give a discount

10% discount

20% discount

30% discount or more

I currently make deliveries from 7pm to 6am and offer the following discount to those receivers (specify discount below).

Would you be interested in participating in an Off Peak Delivery pilot project in which some your deliveries were made during off peak hours between 7pm and 6am?

Yes

I may be interested and would like more information

No

Other, please explain below.

Do you have any comments you would like to share with us?

Footnotes

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- ⁱ Metropolitan Planning Council, “Moving at the Speed of Congestion,” page 2, August 2008.
- ⁱⁱ Chicago Metropolitan Agency for Planning (CMAP), “Go To 2040 Comprehensive Plan,” page 309, 2010.
- ⁱⁱⁱ CMAP, “Metropolitan Chicago's Freight Cluster: A Drill-Down Report on Infrastructure, Innovation, and Workforce, Technical Summary,” page 11, 2012
- ^{iv} Chicago Metropolitan Agency for Planning (CMAP), “Go To 2040 Comprehensive Plan,” page 309, 2010.
- ^v Drew Williams- Clark, Chicago Metropolitan Agency for Planning, “2014 Municipal Survey Results,” September 3, 2014.
- ^{vi} Jose Holguín-Veras, Cara Wang, Michael Browne, Stacey Darville Hodge, and Jeffrey Wojtowicz, “The New York City Off-Hour Delivery Project: Lessons for City Logistics,” *8th International Conference on City Logistics, Elsevier Ltd.*, 2014.
- ^{vii} Ibid.
- ^{viii} Jose Holguín-Veras, Kaan Ozbay, Alain Kornhauser, Anthony Shorris, and Satish Ukkusuri, “Integrative Freight Demand Management in the New York City Metropolitan Area; Final Report,” September 30, 2010.
- ^{ix} Jose Holguín-Veras et al., *The New York City Off-Hour Delivery Project: Lessons for City Logistics*, 2014.
- ^x Illinois Department of Transportation, Illinois State Rail Plan, December 2012, page 6-8.
- ^{xi} Ibid.
- ^{xii} Jose Holguín-Veras, “The Off Hour Deliveries NYC Project,” *Rensselaer*, August 17, 2011.
- ^{xiii} Ibid
- ^{xiv} Jose Holguín-Veras and Felipe Aros-Vera, “Self-supported freight demand management: pricing and incentives,” *Springer-Verlag Berlin Heidelberg and EURO - The Association of European Operational Research Societies*, December 16, 2013.
- ^{xv} Jose Holguín-Veras, “The Off Hour Deliveries NYC Project,” 2011.
- ^{xvi} Jose Holguín-Veras, “Urban Freight Transport: The Final Frontier (and our role as the pioneers),” *Rensselaer*, 2013.
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- ^{xviii} Cambridge Systematics, Inc. “Congestion Mitigation Commission Technical Analysis; Night Delivery Incentives.” December 10, 2007.
https://www.dot.ny.gov/programs/repository/Tech%20Memo%20on_Night%20Delivery%20Incentives.pdf.
- ^{xix} Illinois Tollway and CDM Smith, “Illinois Tollway Commercial Vehicle Strategic Plan,” January, 2015
- ^{xx} Jose Holguín-Veras and Felipe Aros-Vera, “Self-supported freight demand management: pricing and incentives,” December 16, 2013.
- ^{xxi} Jose Holguín-Veras, “The Off Hour Deliveries NYC Project,” August 17, 2011.
- ^{xxii} Jose Holguín-Veras and Stacey Hodge, “Lessons from the Off-Hour Delivery Program in New York City,” *VREF Center of Excellence for Sustainable Urban Freight Systems*, August 15, 2013.
- ^{xxiii} City of Seattle, “Seattle Urban Mobility Plan.” January, 2008.
<http://www.seattle.gov/transportation/docs/ump/10%20SEATTLE%20Best%20Practices%20in%20Freight%20Movement.pdf>
- ^{xxiv} Jose Holguín-Veras and Felipe Aros-Vera, “Self-supported freight demand management: pricing and incentives,” December 16, 2013.
- ^{xxv} NICHES (New and Innovative Concepts for Helping European Transport Sustainability), “Policy Notes: Innovative Approaches in City Logistics; Inner-city Night Delivery,” 2010.
- ^{xxvi} Jose Holguín-Veras et al., “Integrative Freight Demand Management in the New York City Metropolitan Area; Final Report,” September 30, 2010.
- ^{xxvii} Ibid.
- ^{xxviii} PierPass, “PierPass Diverts 30 Millionth Truck Trip From Los Angeles, Long Beach Peak Traffic,” 2014,
- ^{xxix} Cambridge Systematics, Inc., “Congestion Mitigation Commission Technical Analysis; Night Delivery Incentives,” December 10, 2007.
- ^{xxx} Transportation Research Board, “Freight Transportation; Trucking Issues,” *Transportation Research Board*. Washington, D.C, 1990.

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^{xxx} **Ibid**

^{xxx} Jose Holguín-Veras and Stacey Hodge, “Lessons from the Off-Hour Delivery Program in New York City,” August 15, 2013.

^{xxx} José Holguin-Veras, “Freight Demand Management: TDM’s Next Frontier,” 2015.

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