

A faded background image of a city street scene. In the foreground, a large black UPS delivery truck is parked on the right side of the street, with its rear door open and a worker loading boxes onto a hand truck. To the left of the UPS truck are two white delivery vans: a FedEx Express van and a Purolator van. In the background, there are multi-story buildings, including one with a sign that says "DELTA HOTEL".

Reflections From the Curb: Harnessing Data to Maximize Operations

Automotus



Agenda

- Curb management overview
- Where we've been, and where we are now
- Where we're going - trends and future outlook
- Discussion and Q&A

Areas of Curb Management



Tools & Services

Digital inventory of curb assets
Curb activity monitoring
Data aggregation and analysis
Movement of people & goods
Safety & enforcement
Wayfinding & dynamic signage
And many more....

Where We've Been: Recent Curb Management Trends

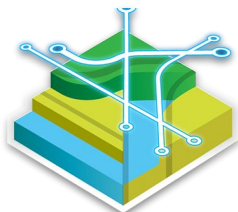
Federal Funding Has Played A Huge Role



SMART

Strengthening Mobility and Revolutionizing
Transportation (SMART) Grants Program

Advanced Transportation Technologies and
Innovative Mobility Deployment



**COMPLETE
STREETS**

AI

Generating, Integrating, and Activating Data for Mobility

Safe Streets
For All (SS4A)
Grant Types:



Action Plan Grant:

- Assists communities without Vision Zero Plan
- Lays foundation for comprehensive planning



Implementation Grant:

- Provides funding to implement developed strategies
- Executes on systemwide community projects

Major Themes



Strengthening Mobility and Revolutionizing
Transportation (SMART) Grants Program

\$94 million for 59 projects across the country

\$18 million for curb management related projects

- Digital curb inventory
- Curb activity data collection
- Zero emissions delivery



Multimodal Curbside Analytics

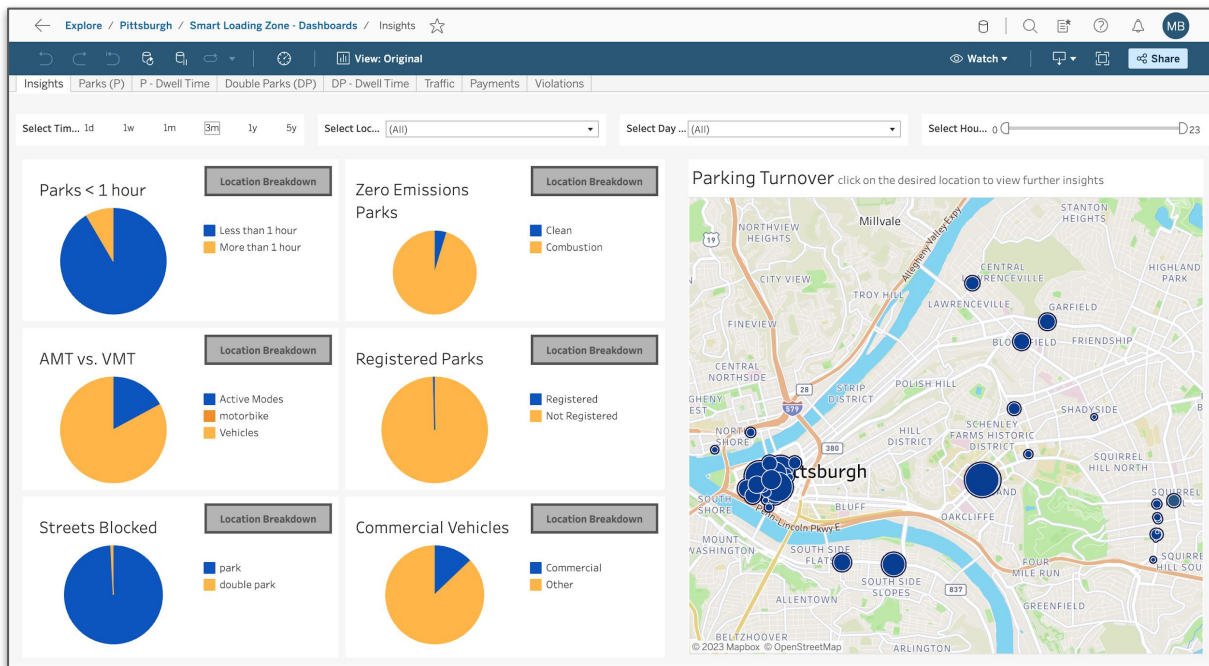
Key metrics tracked:

- Double parking
- Emissions
- Utilization
- Traffic flow
- Compliance
- Safety
- Revenue (actual or potential)

Breakdown by:

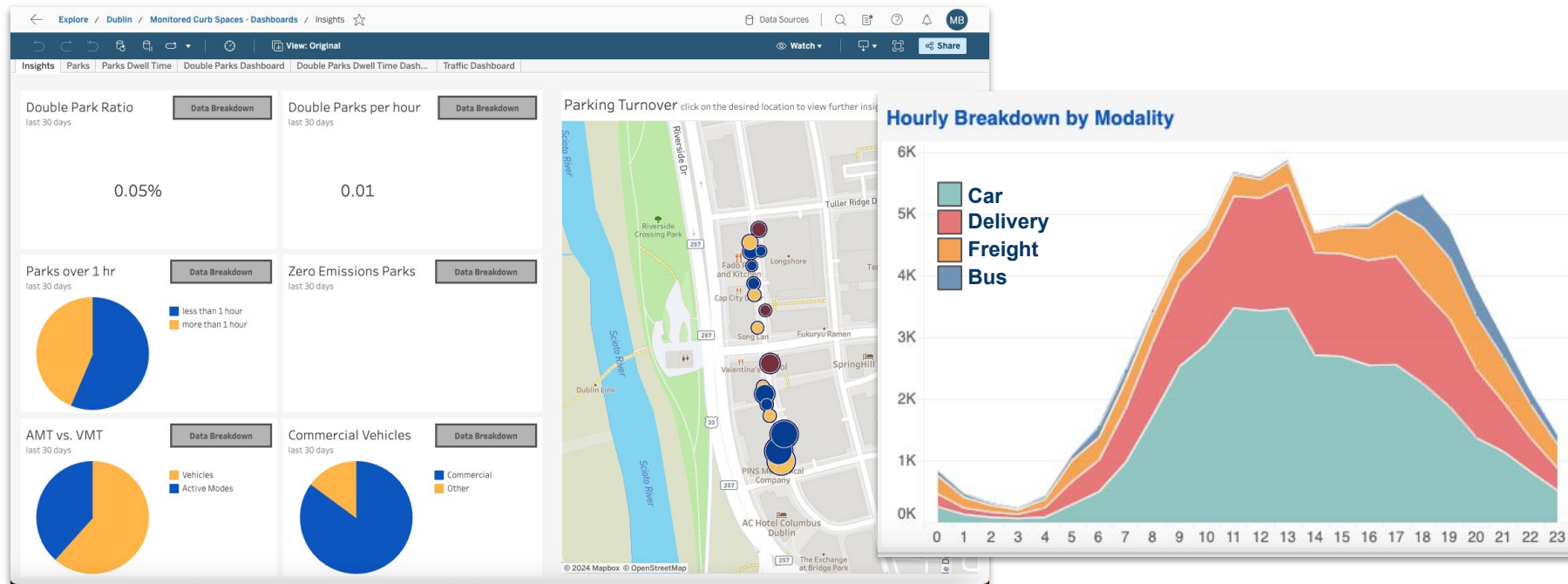
- Modality
(Car, van, freight, bicycle, bus, pedestrian, etc)
- Combustion type
(EV, hybrid, ICE)

Detailed insights on curb utilization to inform smart policy and operational decisions



Curb Activity Data Collection

Example Applications



Zero Emissions Delivery Zones

Take action on climate goals by incentivizing zero emission deliveries. Example policies include:

- Enforce zones exclusively for ZE vehicles
- Automatically extend discounted rates to electric or hybrid vehicles in loading zones

Automotus supports the nations first two zero emissions delivery zones via partnerships with:



Los Angeles Cleantech
Incubator



Portland SMART Grant Zero Emissions Delivery Zone Project

- Monitoring permitted vs. non-permitted use of zero emission delivery zones
- Collaboration with local zero emissions fleets
- Integration w/digital inventory via CDS



Miami-Dade SMART Grant: Zero Emissions / Micro Freight



- Monitor and automate loading zones and micro freight zones
- Collaboration and data sharing with Miami Parking Authority



Future Outlook:
**Much Fewer Federal
Funding Opportunities**

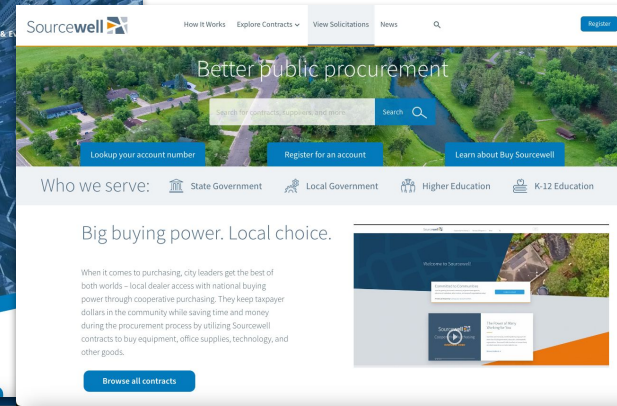
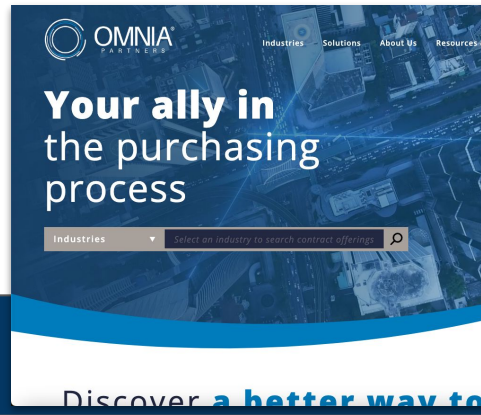
SMART Grant-era Takeaways

Challenges

- LPR & enforcement are prohibited, limiting operational impact
- Bridging gap between pilot and sustainable program
- Administrative burden

Opportunities

- Automation can generate revenue for self-funding, scalable programs
- Co-operative purchasing established for curb management solution category



Trend: Adoption of Vision Zero

Increased focus on eliminating traffic-related deaths and critical injuries through a variety of safety protocols

Blocked Bike Lanes



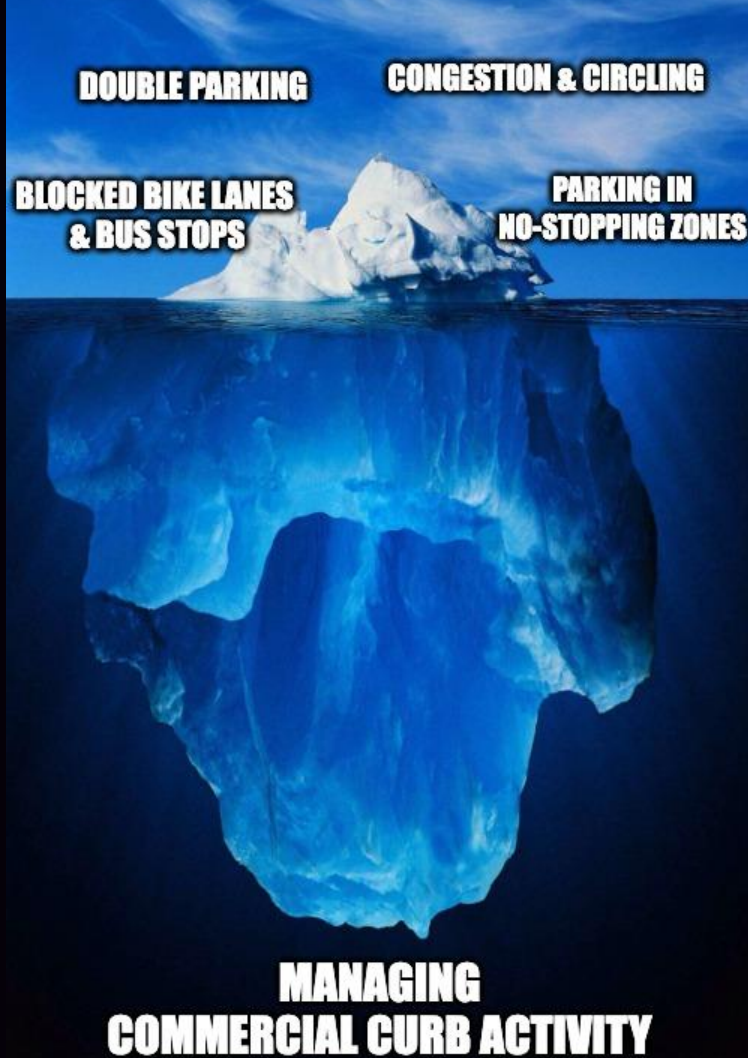
Blocked Crosswalks & Red Curbs



Double Parking

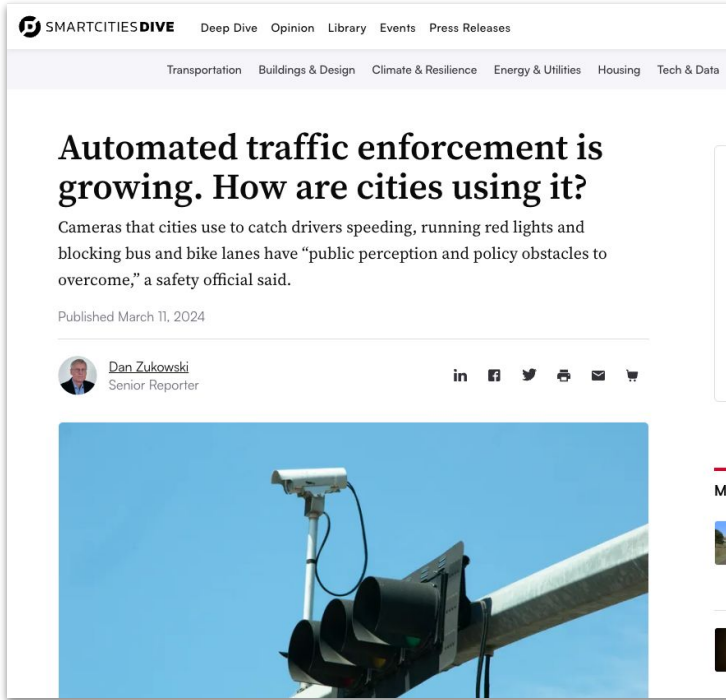


**More
effective
enforcement
to address
symptoms**



**Create curb
access &
turnover to
address root
cause**

Trend: Expansion of Automated Enforcement



Red light & speed cameras

Bike lanes

Bus stops and lanes

Double parking

Parking violations

Loading violations

EV charging violations (ICE-ing)

Improving Enforcement Through Automation

Automated Enforcement

Send citations by mail

Pittsburgh Parking Authority
PO BOX 840 PITTSBURGH, PA 15228-0840

9/14/2022

VIOLATION WARNING

The vehicle referenced below was photographed on 08/18/2022 at 01:20 PM in violation of Pittsburgh's parking ordinances within Code of Ordinances Article VI. This letter shall serve as notification that your vehicle was issued a warning in lieu of a parking ticket. Future violations may result in a parking ticket being issued. This warning does not require payment.

Ticket No.	On Date	At Time	Violation Location
8307052	08/18/2022	01:20 PM	5270 REELER ST
License No.	State		
8YCZ15	CA		

Parking Violation: \$ 541.02 Blue Lane Violation

Item	Amount	
Fine	\$50.00	
F Paid	10/09/2022	
After	\$0.00	
F Paid	10/15/2022	
After	\$0.00	

TOTAL DUE NOW \$55.00

For more information on automated enforcement violations refer to <https://www.pittsburghpa.gov/department/automated-enforcement>. For more information, or questions you may have, please call 412-660-7222.

CONSENT TO MAILING: ☐ NO MAILING REQUESTED: ☐ ADDRESS SERVICE REQUESTED: ☐

AMOUNT ENCLOSED:

4086755

4086755
4086755
4086755
4086755
4086755

PITTSBURGH PARKING COURT
PO Box 840
Pittsburgh, PA 15228-0840
DFFFFAFDDFFTAFFDDTFAADFADFAAF
AAFAAFDFDFDADAATFAFAADAF
-HNSSTLTD-



Directed Enforcement

Notify staff in real-time via:

- Enforcement Handhelds
- Email or text

Citation Number: 763150133

License Plate Capture: 10:29 AM

A rear view of a silver car with a license plate capture overlay. The car is parked on the side of the road, and the text "License Plate Capture: 10:29 AM" is overlaid in a white box with a red border.

Citation Details

Violation Date	Violation Time	Location	City
10/16/2024	10:29 AM - 10:29 AM	-	Pittsburgh, PA
Vehicle	Has Transaction	Violation Type	
FL	No	Bike lane	

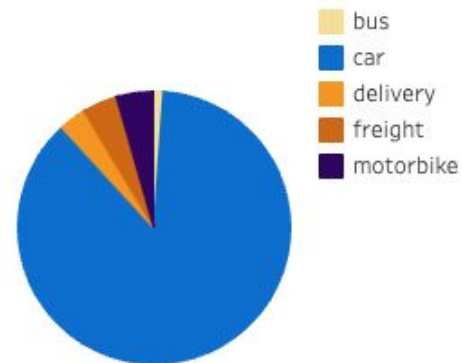
Case Study: Bike Lane Safety in Atlanta



Atlanta deployed their first five cameras in Q1 2024 monitoring high-traffic bike lane corridors.



Modality Breakdown



Location Breakdown

- bus
- car
- delivery
- freight
- motorbike

Atlanta, GA Bike Lane Analytics Insights



	Unprotected Bike Lanes	Protected Bike Lanes
	 An aerial photograph showing a black car in a bike lane. The car is highlighted with a yellow square. The bike lane is marked with yellow double lines. A small text overlay at the bottom of the image reads 'Dwell Time: 0:13:08.445000'.	 An aerial photograph showing a black car in a protected bike lane. The car is highlighted with a yellow square. The bike lane is separated from the rest of the road by a white physical barrier.
Avg. Daily Violations	37.3	0.34
Avg. Violation Length	5min 27sec	2min 28sec
Hours Blocked Daily	3h 23min	54sec

Automated Curb Management is Not Just for Large Cities!



WYMT Weather News Election Results Sports Watch WYMT Now Flood Relief

Pikeville to police parking with automated camera system



Weekday broadcast of WYMT Mountain News at 5:30

By Buddy Forbes
Published: Dec. 27, 2023 at 6:22 PM EST | Updated: Dec. 27, 2023 at 6:43 PM EST



Automated Enforcement in Pikeville



- No meters & unable to chalk tires to enforce 2hr limits
- No staff available to enforce and insufficient budget to hire
- Deployed on public-private partnership model



101%

increase in parking compliance within 4 months

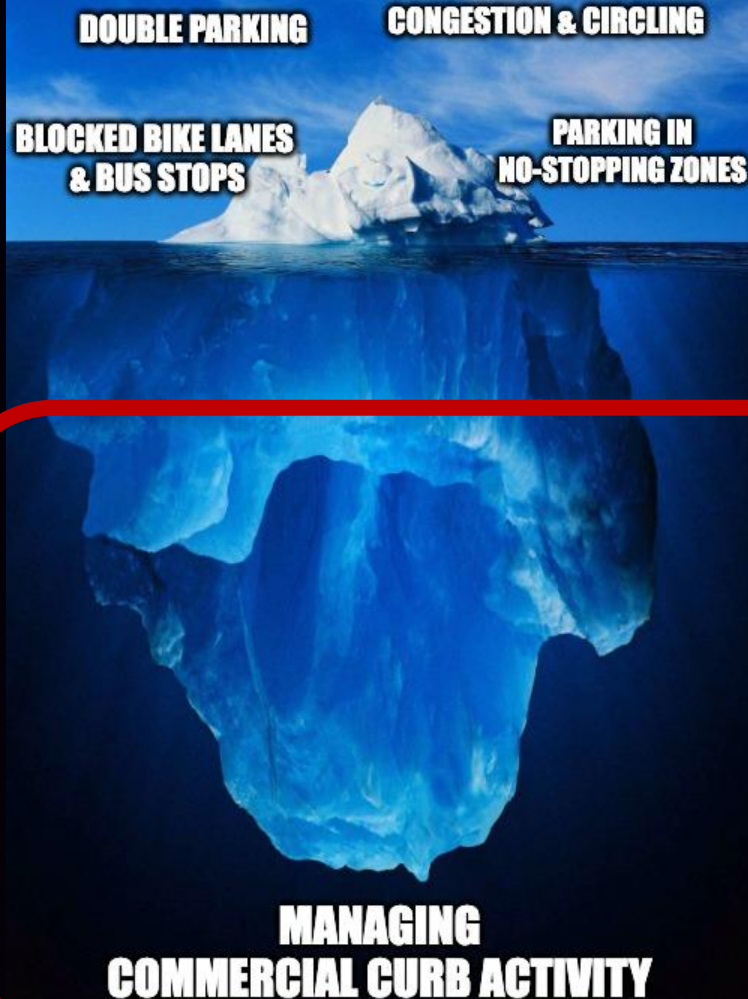
13%

decrease in congestion

64%

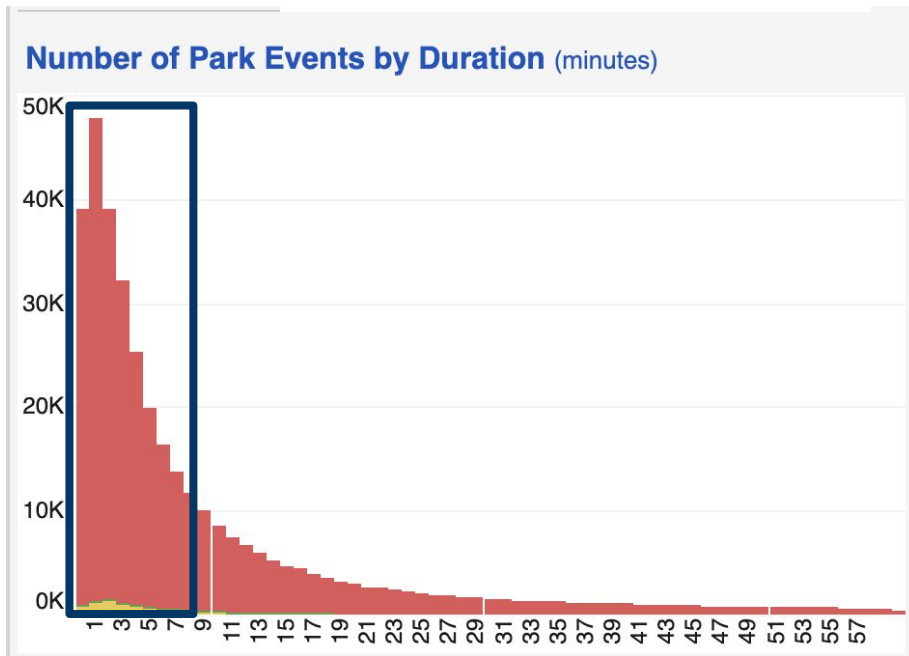
decrease in double parking

**More
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**Create curb
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Commercial Curb Demand Has Outpaced Policy



50%+

of curb activity is **commercial**
in nature (7min or less)

<5%

Commercial drivers pay for
parking on apps, in meters, or
via API

The Problem: City Perspective



37%

of parking is **double parking**
creating congestion + safety
hazards

25MM Metric Tons

CO₂ emissions caused by
last-mile delivery

The Problem: Delivery Fleet Perspective



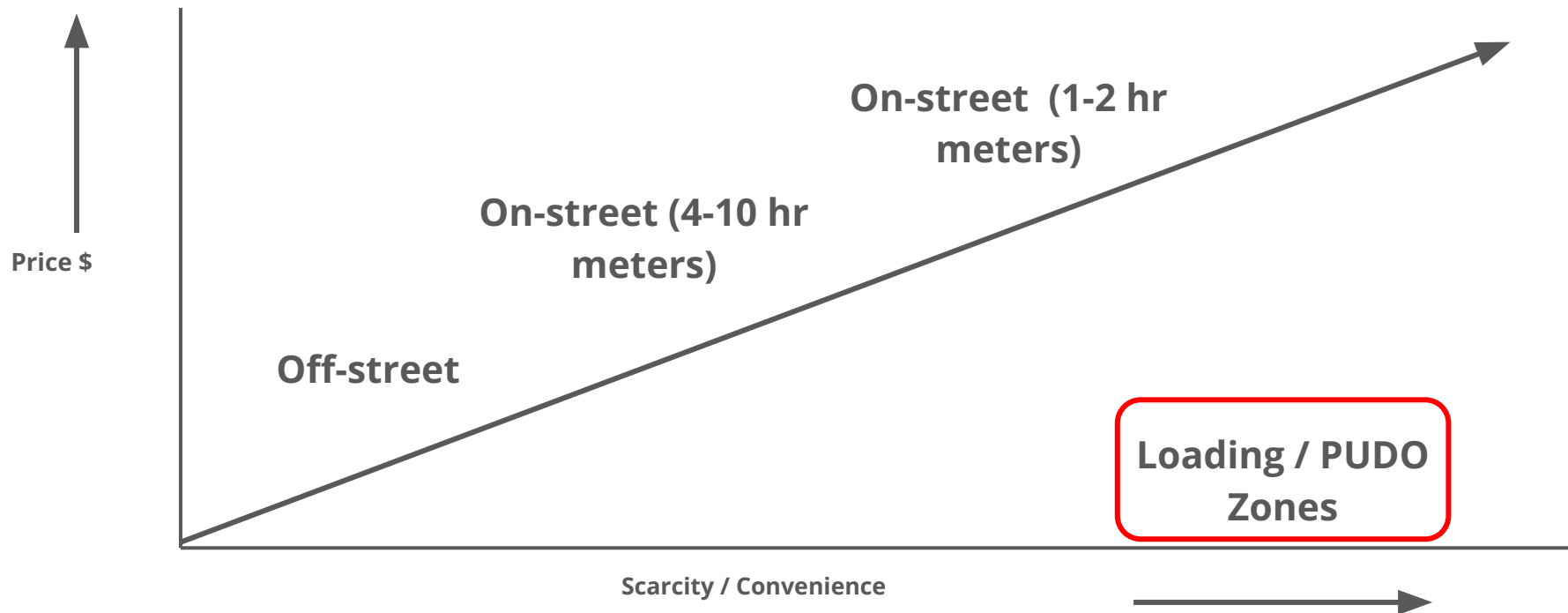
\$9 Billion+

Spent on **failed deliveries + parking tickets** because driver couldn't efficiently access the curb in the US

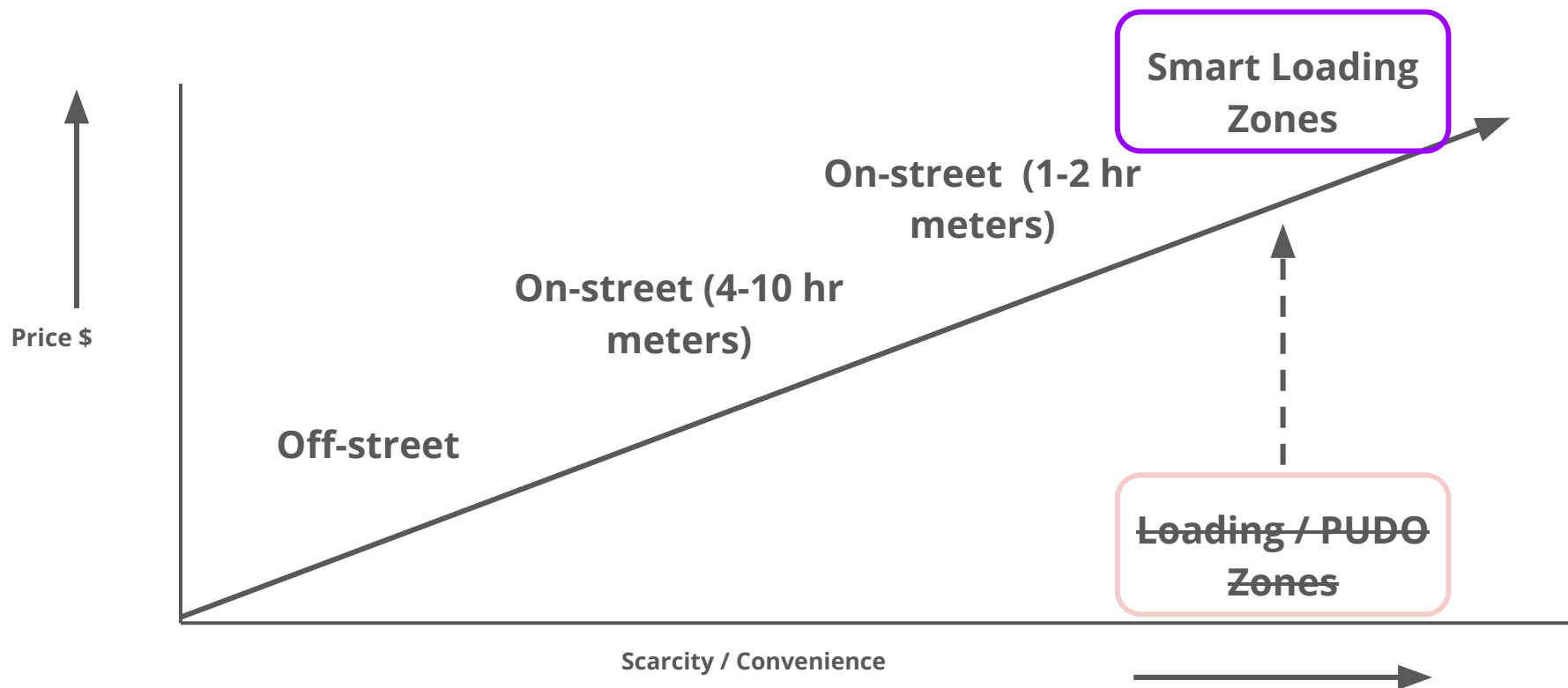
100-180

Stops **per day** for typical Amazon DSP delivery driver

Undervaluing The Highest Demand Curb Space is the Status Quo



The Solution: A Pay-Per-Use Model for High Demand Curb Space



Traditional Loading Zones vs. Smart Loading Zones

Traditional Commercial Loading Zone

Restricted access to freight vehicles

- **Impact:** Excludes gig economy and “mom and pop” businesses who use a passenger vehicle for loading & unloading

Free or annual permit model

- **Impact:** Consumers and local businesses subsidize commercial loading



Smart Loading Zone

Open to anyone who registers and pays

- **Impact:** Supports the short term parking needs of all drivers

Curb users pay for their usage by the minute

- **Impact:** Commercial operators pay for what they use so others don't have to subsidize



Manage Loading Demand With Usage Based Rates

Sample Progressive Rate Structure for Loading

Minutes	Rate Per Minute	Total Maximum Cost
0-5	\$0.07	\$0.35
5-15	\$0.14	\$1.75
15-30	\$0.21	\$4.90
30-60	\$0.28	\$13.30

- **Max Duration:** 60 min
- **Permissions:** Available to any vehicle



Findings from Earlier Loading Pilots (2019-2022)



App or reservation-based pilots in Philadelphia, DC, Columbus, Nashville and more concluded that:

1. Compliance must be ubiquitous
2. Automation is key for driver buy-in. App based collection rate ~2%
3. Automation is key for enforcement / compliance

the most effective solutions work when cities and fleets are aligned...



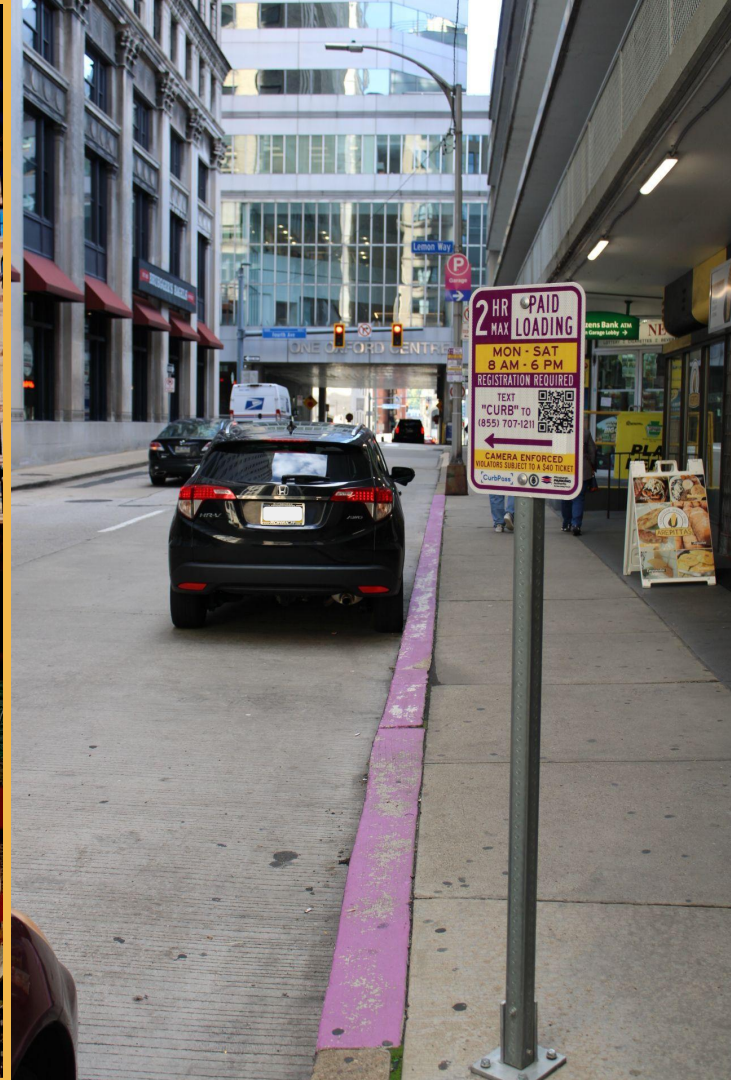
cities focus

- reduce double-parking & congestion
- create more sustainable + equitable streets
- vision zero initiatives
- increase curbside revenues



fleets focus

- reduce time spent searching for parking
- access real-time parking & congestion data
- reduce parking tickets



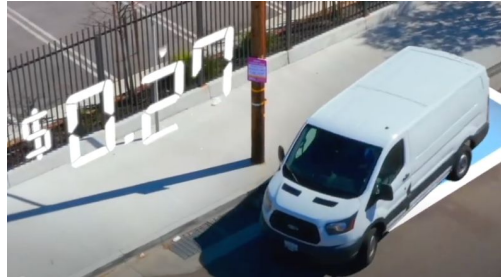
Automated Smart Loading Zone Workflow

One-time registration



- License plate number
- Digital wallet w/auto-reload

Fully automated billing



- No driver action needed, like NC Quick Pass or Palmetto Pass for the curb
- Billed for exact time used

Automated enforcement



- Unregistered drivers **invoiced** or cited by mail depending on City's business rules

Important Note! Invoicing by mail is a permissible alternative to issuing citations by mail in most cities

Suggested Escalation for Unpaid Loading Sessions

Unregistered drivers receive a notice by mail for their time at the curb + administrative fee.

Admin fee escalation & discounts incentivize payment & registrations

1st Notice

- Amt. for curb use
- +\$10 admin fee
- \$10 discount offered on admin fee with registration

2nd Notice 30 days

- Amt. for curb use
- +\$15 admin fee
- \$10 discount offered on admin fee with registration

3rd Notice 60 days

- Amt. for curb use
- +\$50 fine

Options for Unpaid Invoices after 60 days:

- Send to collections
- Scofflaw booting/towing

Fort Lee Parking Authority
P.O. Box 1113
Fort Lee, NJ 07024

(Leave space blank for mailing details of curb user)

[[Date of Invoice Sent]]

NOTICE OF DELINQUENT PARKING - PAY NOW TO AVOID COLLECTIONS



Invoice Number	License Plate / State
123456	1234567 / XX

Fine (Delinquent payment of 60+ days)	\$50
Total Due if paid after (Initial Notice Date + 60 days)	x+\$50

PAYMENT INSTRUCTIONS
To pay your balance, scan the provided QR code or visit the following website:
<https://www.curbpass.io/paybill>

If you have additional questions or wish to contest this bill, please visit
<https://www.curbpass.io/paybill>

According to our records, the activity described below is in violation of local parking regulations due to unregistered and/or improper use of a Smart Loading Zone(s). As the registered owner or lessee of this vehicle at the time of the parking event, you are responsible for paying the TOTAL AMOUNT DUE (see payment instructions above).

Date / Time	Park Duration	Location	Amount
04/07/24 8:30 AM	15 minutes	[Address of Zone]	
04/07/24 9:30 AM	5 minutes	[Address of Zone]	

The impact we're seeing:

Safety

reducing double-parking
safety hazards

>95%

Congestion

reducing circling the
block + dwell times

>40%

Curb Efficiency

increasing payment +
ticket revenue / zone

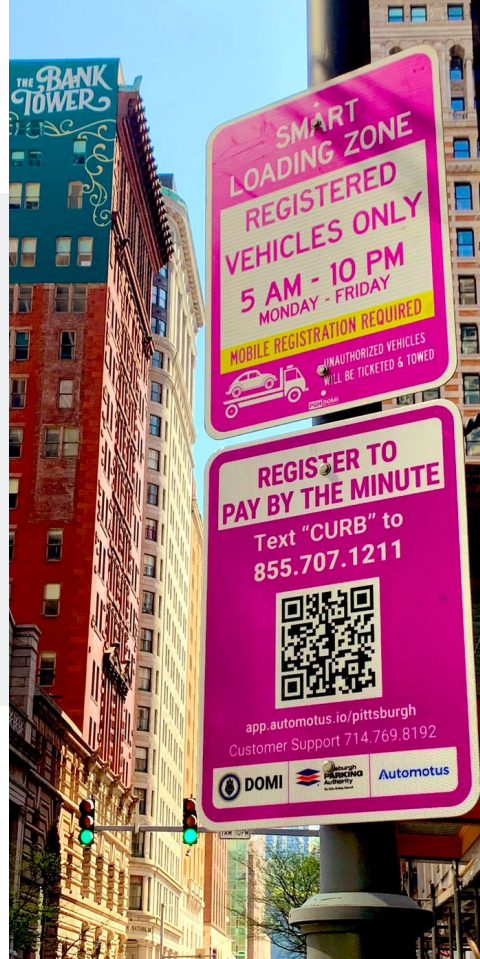
>5x

Emissions

reducing CO₂e

30MT

metric tons / zone





How businesses are reacting

Turnover

increase in deliveries
+ customers

>23%

Registered

drivers and fleets

>9k

"It has been advantageous for us restaurant owners in the Downtown of the city to have the fast unloading line, it allows us to unload the merchandise at the door of our business and avoids double lines and congestion on the street and improves access. We support this initiative."

Danielle Figueroa



"These are very convenient for business owners and managers when stopping into their businesses. I use the smart loading zones many times a week"

Maggie Colella, Owner of
Beauty Boost

"I own operate a small delivery service company for Amazon and the majority of our routes are in the more congested areas of Pittsburgh. Since the implementation of the Smart Zone Parking program it has increase delivery efficiencies, minimized any delivery traffic congestion and most importantly reduced driver stress and improved driver safety."

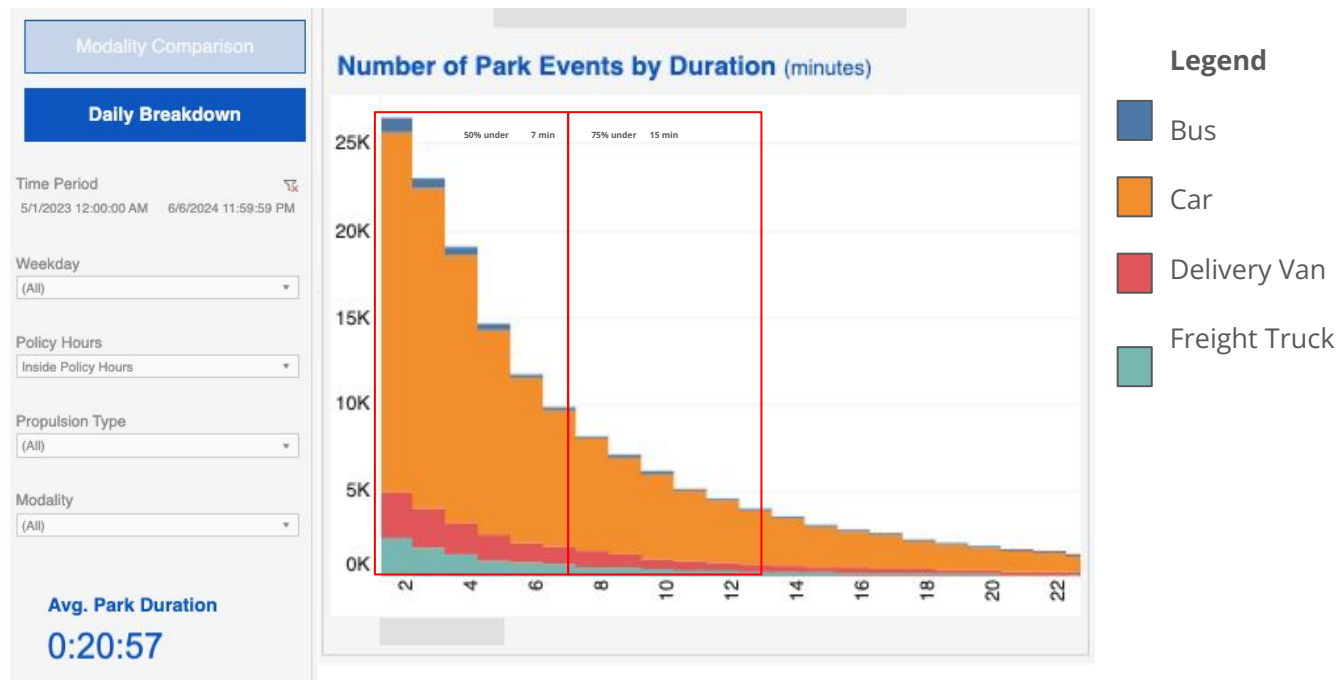
Vince Parrucci, Owner of VIP Delivery Solutions,
Amazon DSP



Progressive Rates Create Turnover

Even with a 1 hour max duration, progressive pricing results in high turnover and short parking sessions:

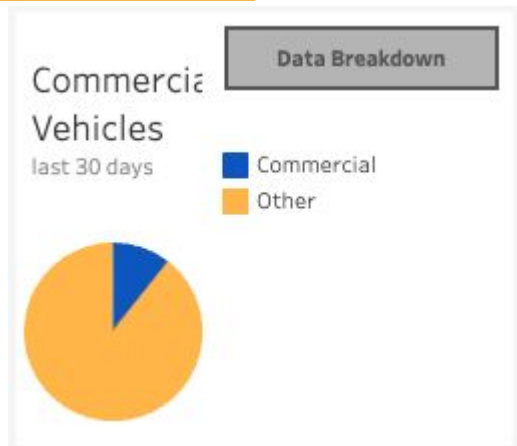
- ~50% are 7 min or less
- ~75% are 15 min or less



Smart Loading Zones Are Highly Utilized by Gig Economy Drivers



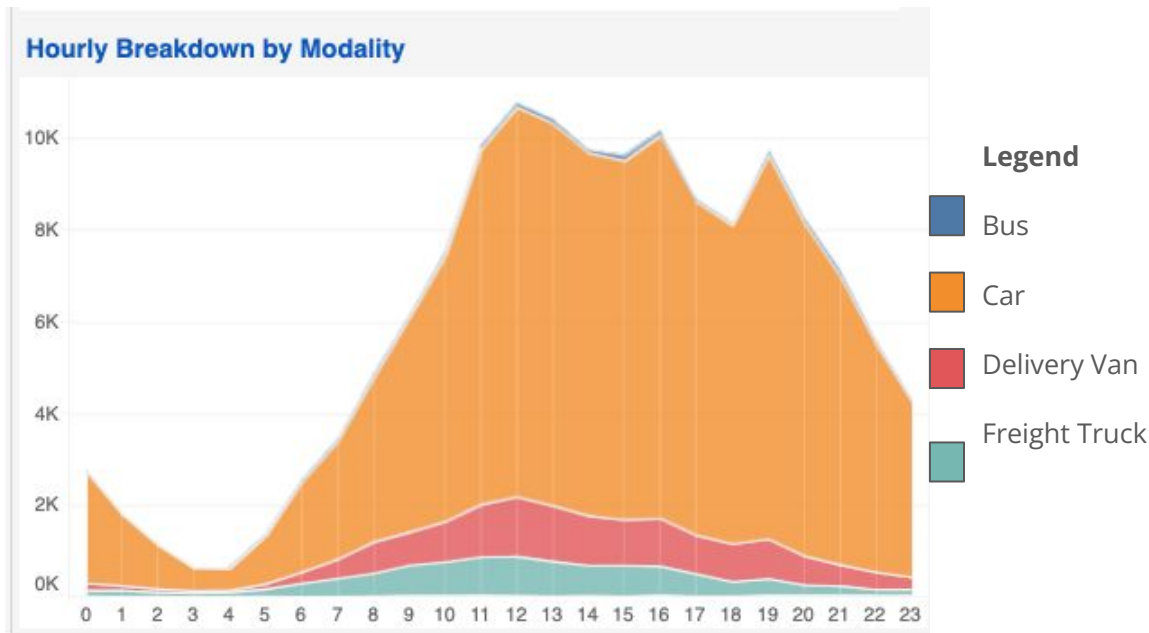
THE CITY OF
PITTSBURGH



Cars = 89%

Freight trucks & delivery vans = 11%

The majority of loading zone use is by personal vehicles - many of which are rideshare, gig economy, and Amazon drivers using personal vehicles for deliveries and dropoffs. This also includes local businesses using personal vehicles.



Positive Feedback for the Program



Editorial: DOMI is a Pittsburgh success story, but there's more work to be done



THE EDITORIAL BOARD ✓
Submit a letter to the editor
letters@post-gazette.com

AUG 21, 2024

5:30 AM



“On this, too, DOMI has made some headway: Last month, the department announced automated enforcement, using cameras and license plate-reading technology, of some bike lanes and no-parking zones. Once the concept is proven, **we’d like to see quick expansion around the city.**”

- [Pittsburgh Post-Gazette Op-Ed](#), Aug. 21, 2024

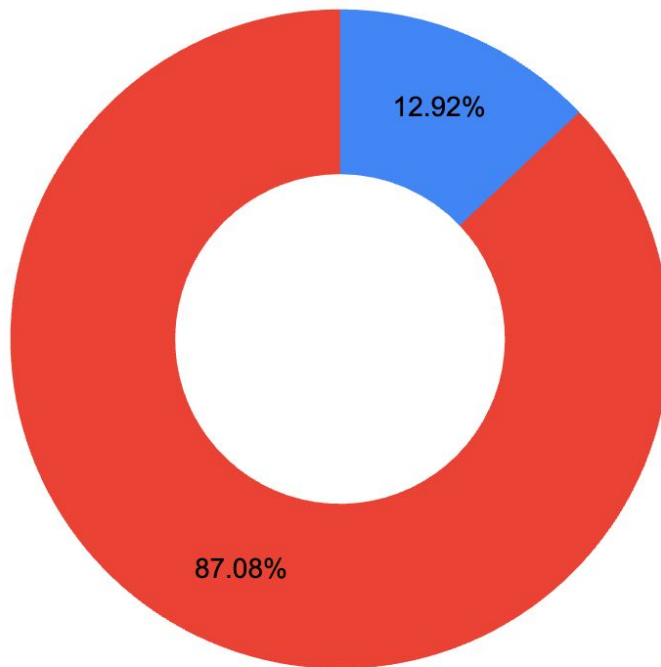
Enforcement - 87% of drivers change behavior after one citation



THE CITY OF
PITTSBURGH

Citation Breakdown

- Percentage of Drivers that receive multiple citations
- Percentage of Drivers with only one citation



Philadelphia Smart Loading Zone Program



- 70 cameras throughout Center City area
- \$6.00/hr (\$0.10/minute)
- Hybrid automated enforcement + directed enforcement for time limits



Houston Smart Loading Zone Program



- 20 cameras in high-demand loading zones Downtown
- Invoicing for unregistered use
- Transition from annual permits + paystations

Progressive Rate Structure for Loading		
Minutes	Rate Per Minute	Total Maximum Cost
0-10	\$0.06	\$0.60
11-20	\$0.12	\$1.80
21-30	\$0.15	\$3.30
30-60	\$0.19	\$9.00

Nashville Smart Loading Zone Program



- 40 cameras on and around Broadway entertainment district
- Invoicing for unregistered use + citation for unpaid invoices
- Progressive rate structure + peak hour pricing

Baseline rates

Minutes	Rate per Minute	Total Maximum Parking Fee
0—5 minutes	\$0.07	\$0.35
5—15 minutes	\$0.14	\$1.75
15—30 minutes	\$0.21	\$4.90

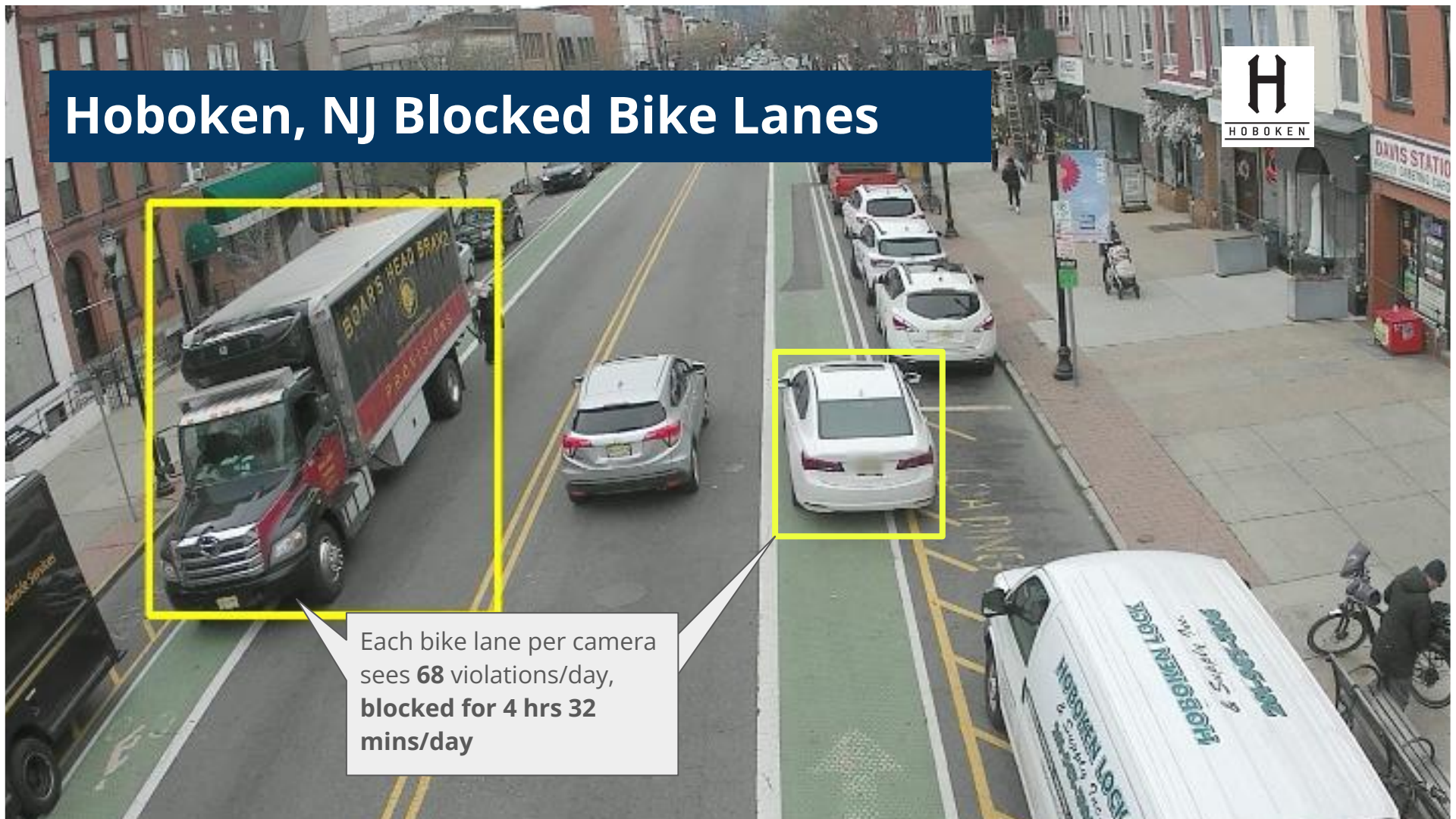
Peak hour rates

Minutes	Rate per Minute	Total Maximum Parking Fee
0—5 minutes	\$0.14	\$0.70
5—15 minutes	\$0.28	\$3.50
15—30 minutes	\$0.42	\$9.80

Hoboken, NJ Blocked Bike Lanes



Each bike lane per camera
sees **68** violations/day,
blocked for 4 hrs 32
mins/day



Hoboken, NJ Blocked Bus Stops



Passengers must board/deboard from the travel lane, creating safety risks

Each bus stop sees **158 violations/day**, blocked for between **4-14 hours / day**

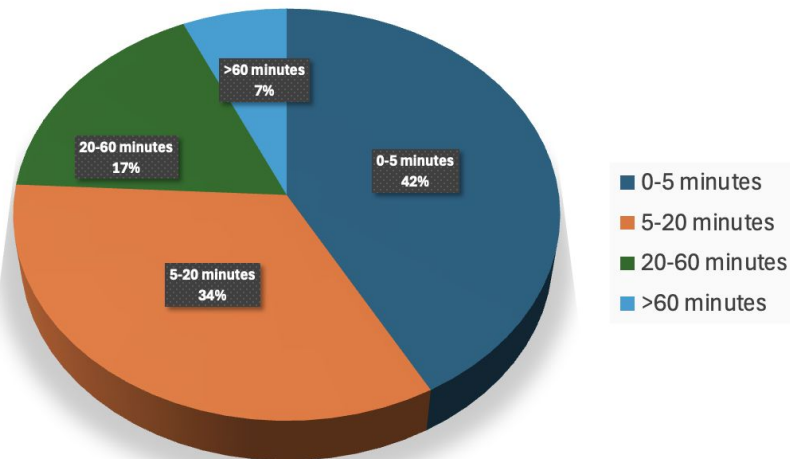
Frequent double parking at bus stops highlights need for more short-term loading space

Bus Stop

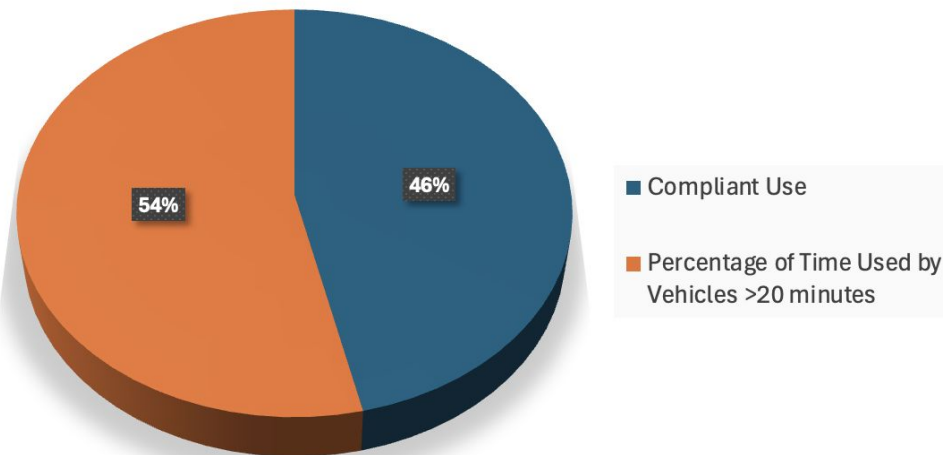
Hoboken, NJ Impact of Loading Zone Overstays



Percentage of Loading Activity by Dwell Time



Loading Use by Hours



While only 24% of parking events exceed loading zone time limits, those violations disproportionately block loading access

Summary

- Think “self-funding”, not “grant funding”
- Policy is a critical starting point
- Automate and iterate

Thank you!

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615-491-6641
