

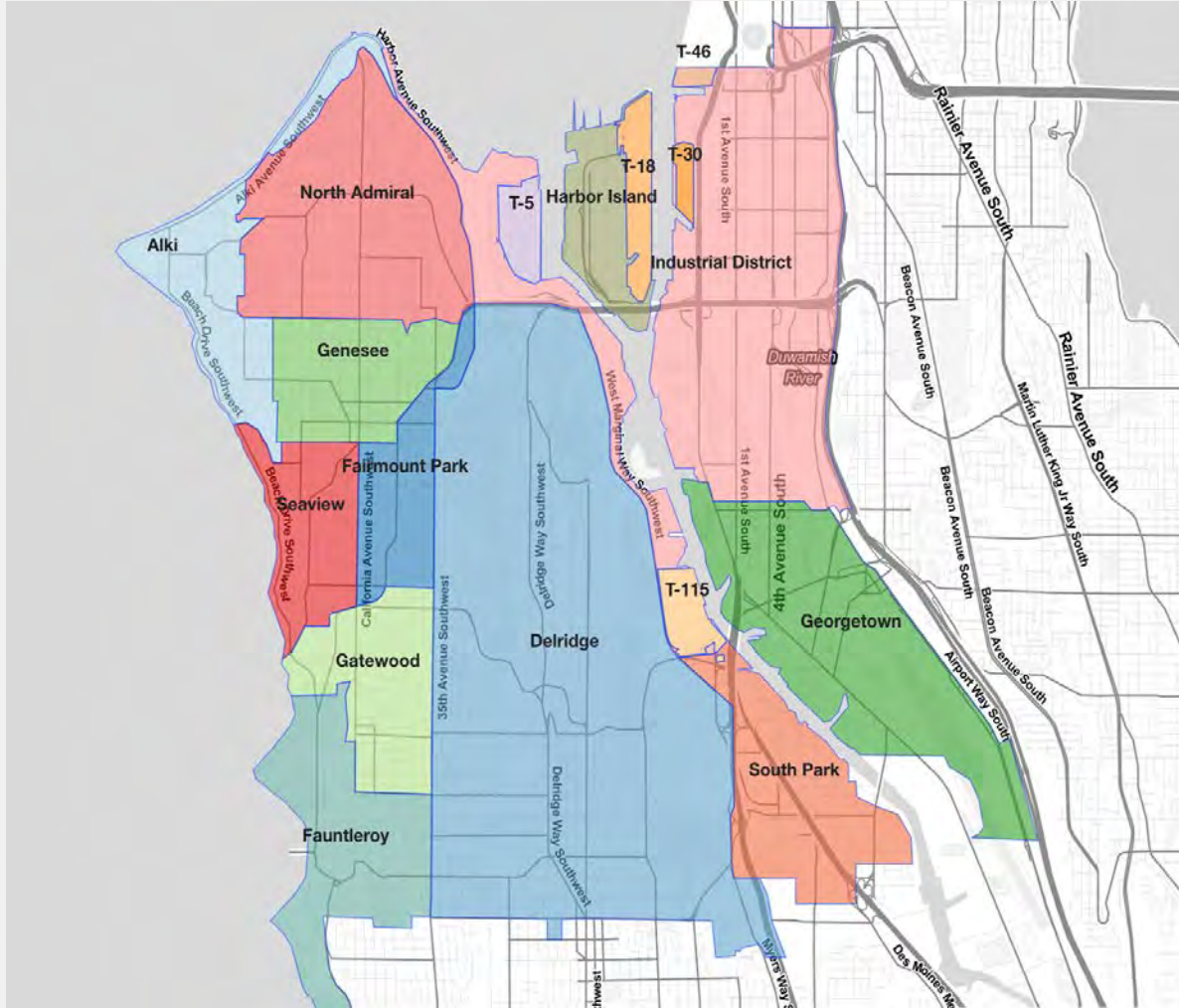


# Urban Freight: Transitions and Opportunities

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# Western Seattle Neighborhoods



## West Seattle

- Alki
- Delridge
- Fairmount Park
- Fautleroy
- Gatewood
- Genesee
- Industrial District
- North Admiral
- Seaview
- South Park

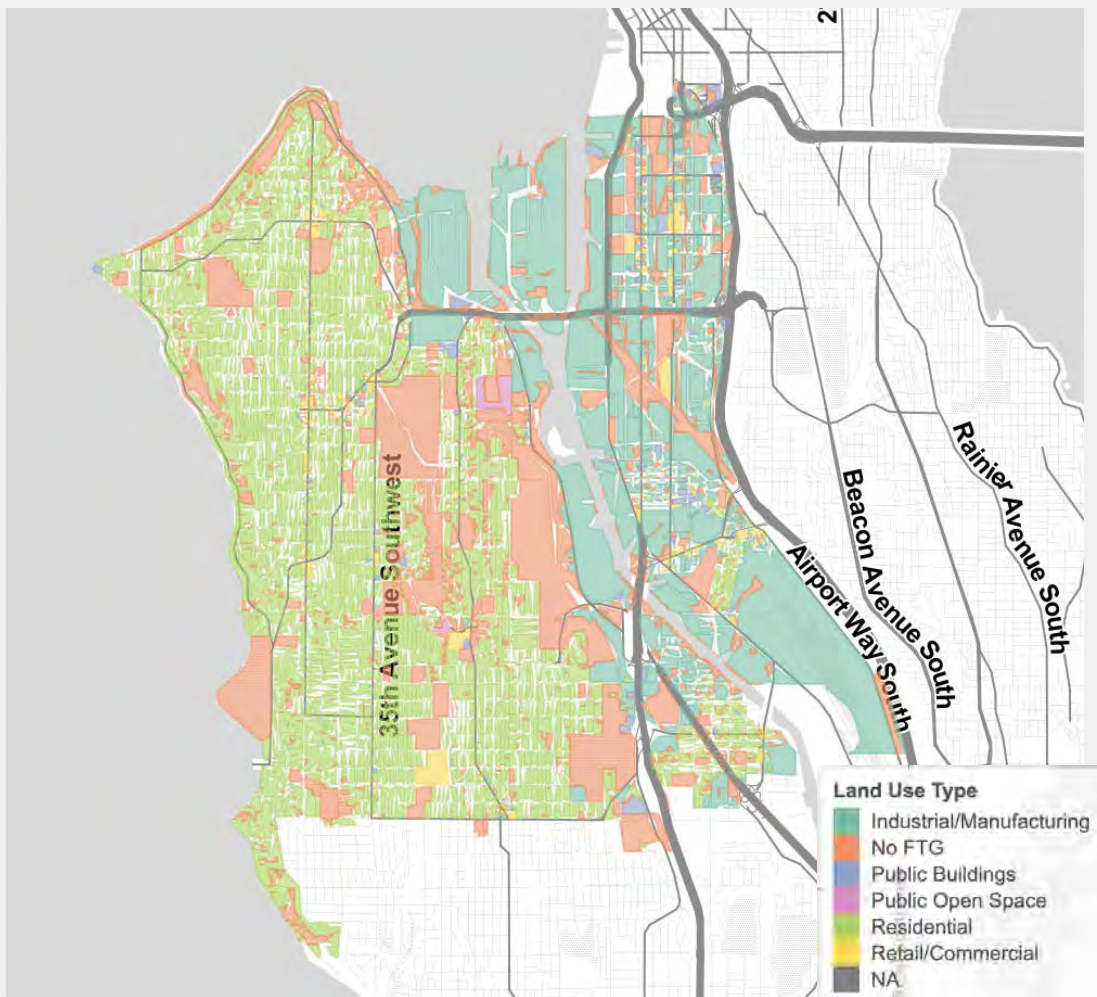
## East of Duwamish

- Georgetown
- Harbor Island

## Port terminals

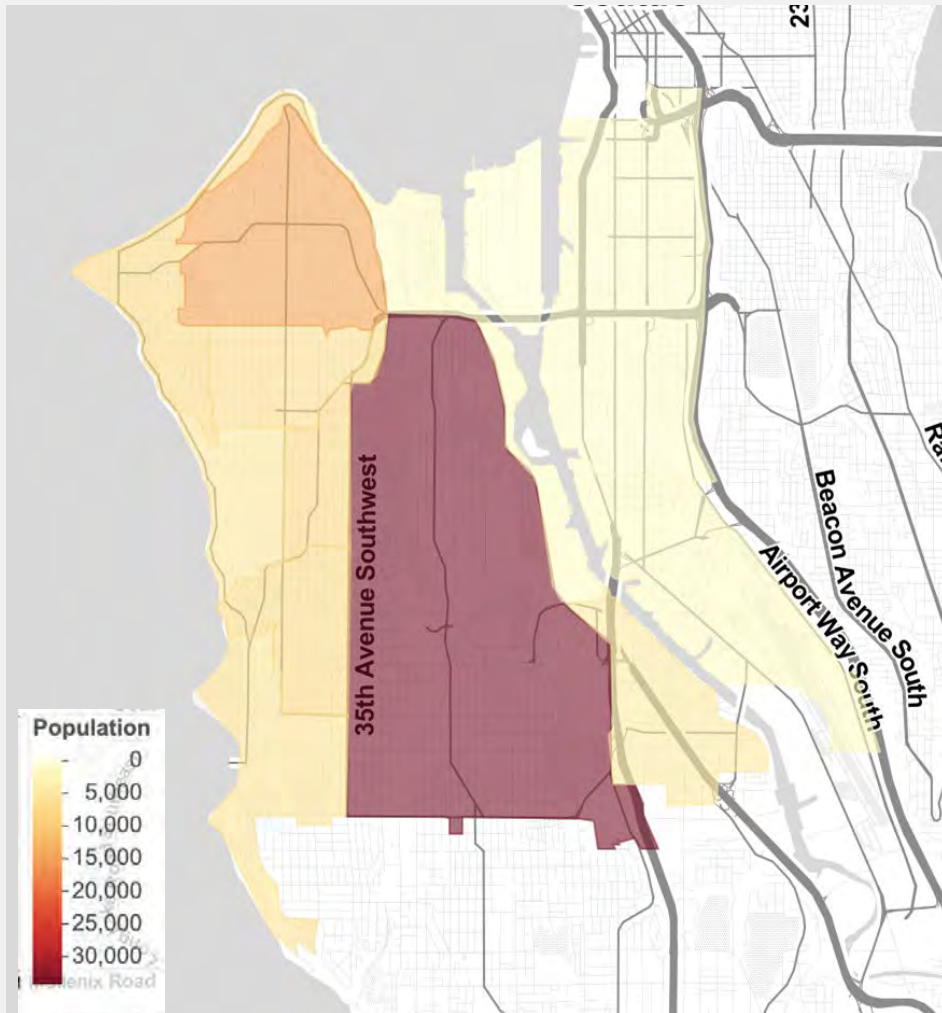
- T-5
- T-18
- T-30
- T-46
- T-115

# Mix of Residential, Industrial, and Manufacturing Land Uses



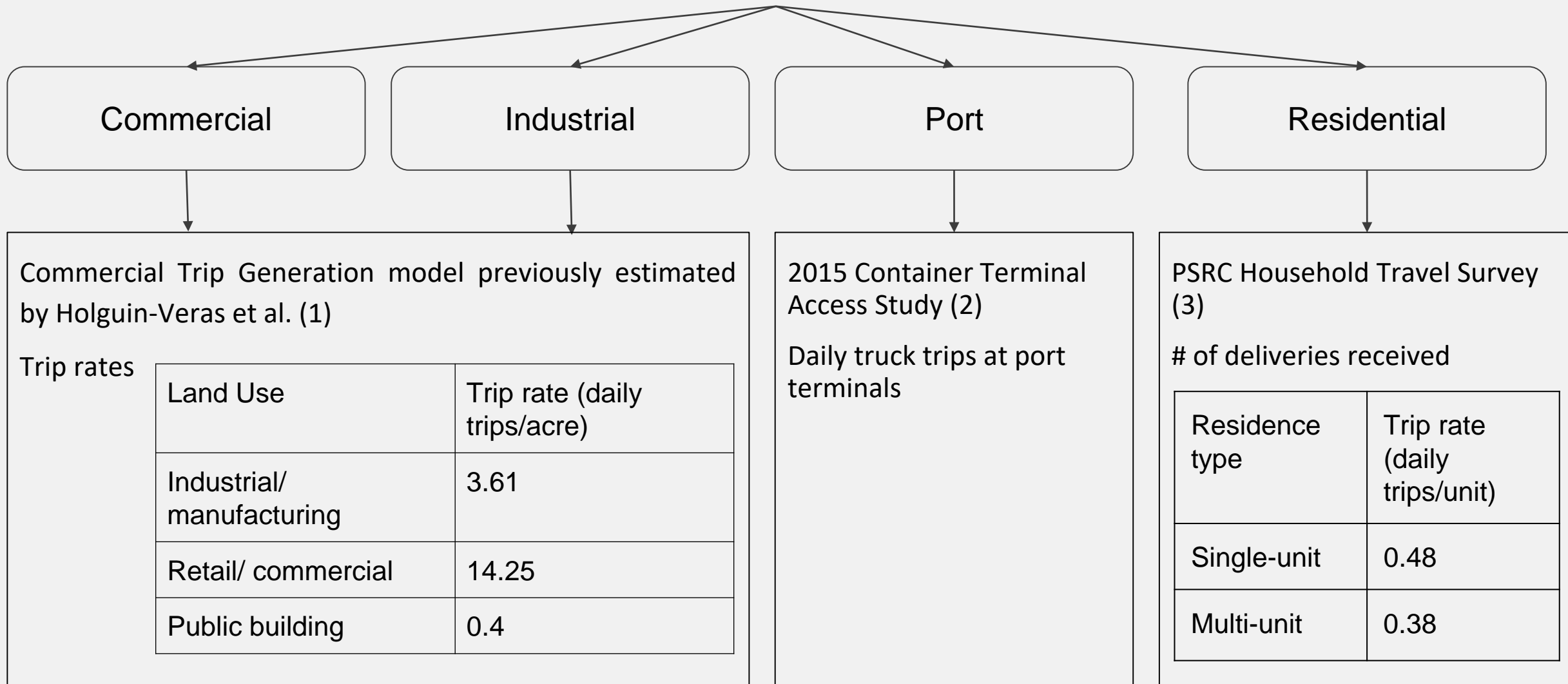
- Main land-use type in the WS peninsula is residential (86.17% residential buildings).
- Highest industrial / manufacturing land use:
  - Industrial District (77.33%)
  - Georgetown (82.54%)
  - South Park (69.71%)
  - Harbor Island (100%)

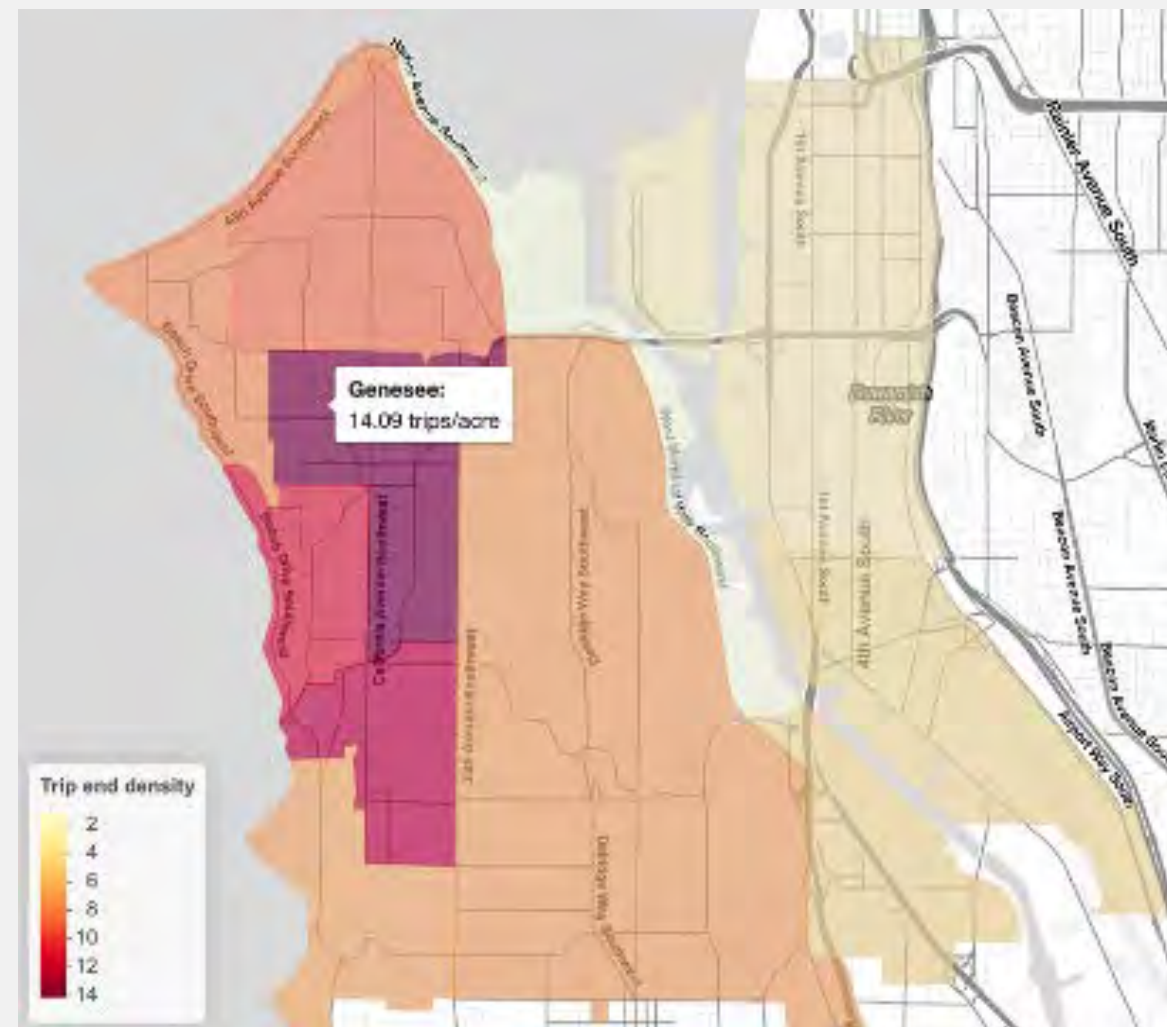
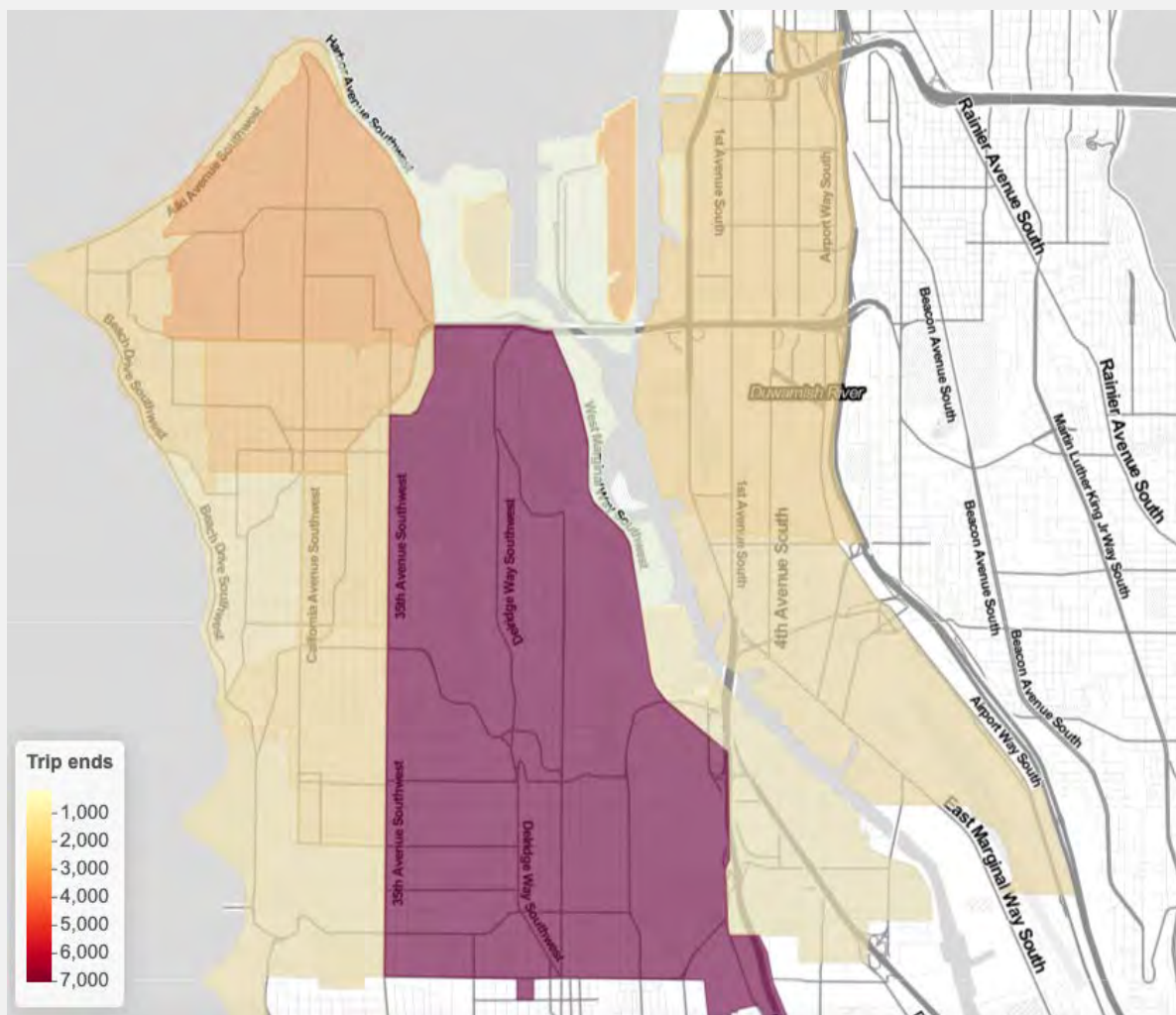
# Population Distribution



- Delridge has the highest population (34,131 residents).
- The neighborhoods with the lowest population are:
  - Industrial District (2,351 residents)
  - Georgetown (1,306 residents)
  - South Park (4,996 residents)
  - Harbor Island (0 residents)

# Land Use



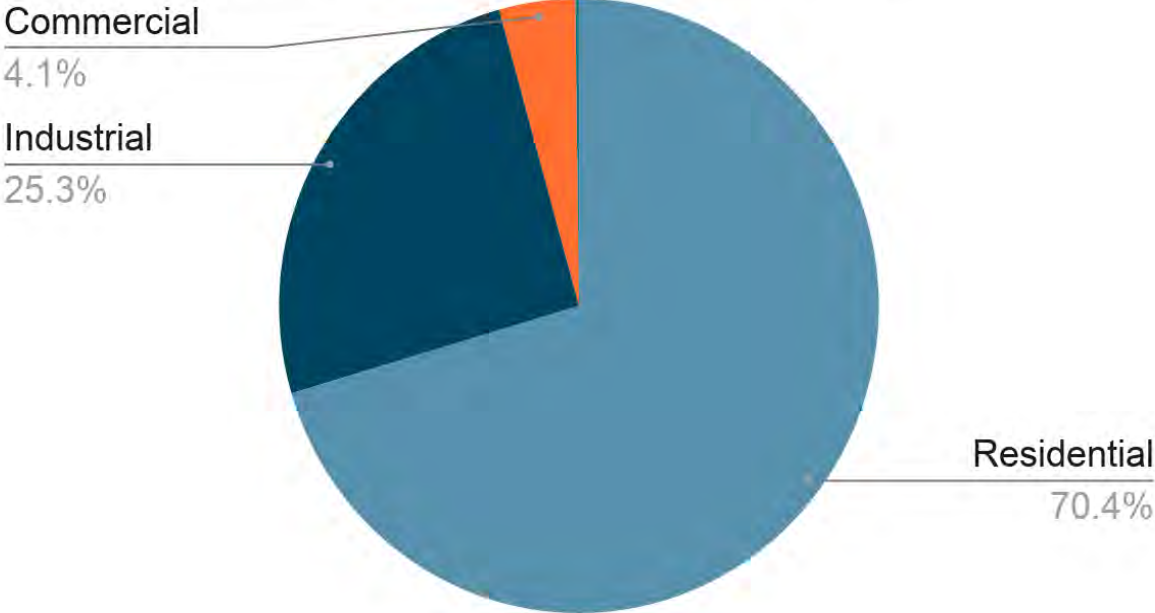


Total deliveries by neighborhood

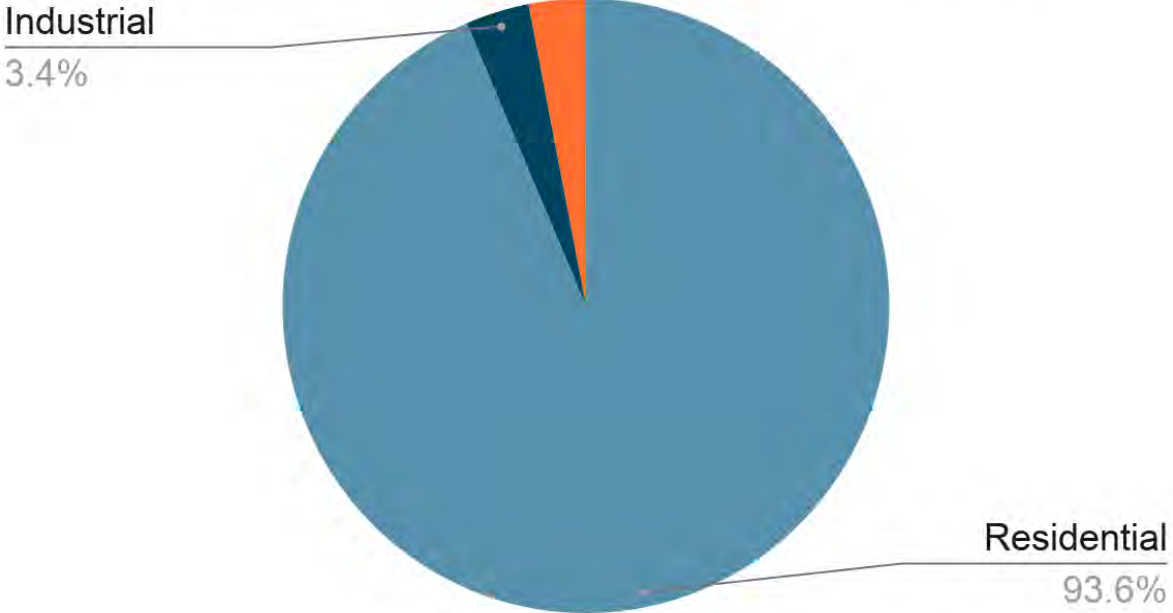
Tot. deliveries/acre of building area

# Total Freight Trip Generation by Land Use Type

Study area (tot: 27,696 del./day)



West Seattle peninsula (tot: 20,505 del./day)



# Our Vision



The Urban Freight Lab is an innovative partnership bringing together private industry, academic researchers, and public transportation agencies to solve urban freight management problems bringing benefits to customers, carriers, and community.





# How We Work

- Engage with private sector executives and operations staff
- Engage with public sector planning and engineering
- Financial commitment from private sector
- Problems are jointly defined
- Academic analyses *and* ground-truthed tests
- Ideas *and* evaluations, analyses, and tests



# Membership: Diverse and Relevant

The UFL is comprised of:

Service/Product	UFL Members
Carriers and Shippers	Amazon, Cornucopia, PepsiCo, UPS
Retailers	Amazon
Infrastructure and operations technology providers	REEF, Grid Smarter Cities, Automotus, Lacuna
Real estate	Terreno
Vehicle and vehicle components manufacturers	Ford, GM, Coaster Cycles, Michelin, URB-E

It is necessary to engage these stakeholders as their decisions all influence urban freight operations and outcomes. By engaging each of these sectors, we are able to understand and solve urban freight challenges efficiently and holistically.

# Areas of Research

1. Urban Goods Delivery
2. Sustainable Urban Freight
3. Curbspace Management
4. Zero Emissions Freight



# Collaborations

We engage with numerous public, private, and nonprofit entities and individuals on a regular basis—more than we could possibly list here.

A few examples of our active research collaborators and partners (excluding academic colleagues):

- U.S. Department of Energy and national laboratories
- Sensors and parking management solutions providers
- City, regional, and state governments
- Global nonprofit research organizations
- Transportation/mobility consultancy firms



# Thought Leadership in Urban Freight

Originated the “Final Fifty Feet” – it started here

- › Coined the term “Final Fifty Feet”
- › Demonstrated this is a costly and understudied area with time studies
- › Inspired follow-on research and exploration

Defined and quantified benchmarks

- › Commercial vehicle parking cruising, vehicle queueing and re-routing
- › Commercial and service vehicle categories and counts in categories

Defined the Urban Freight load/unload network and estimated capacity

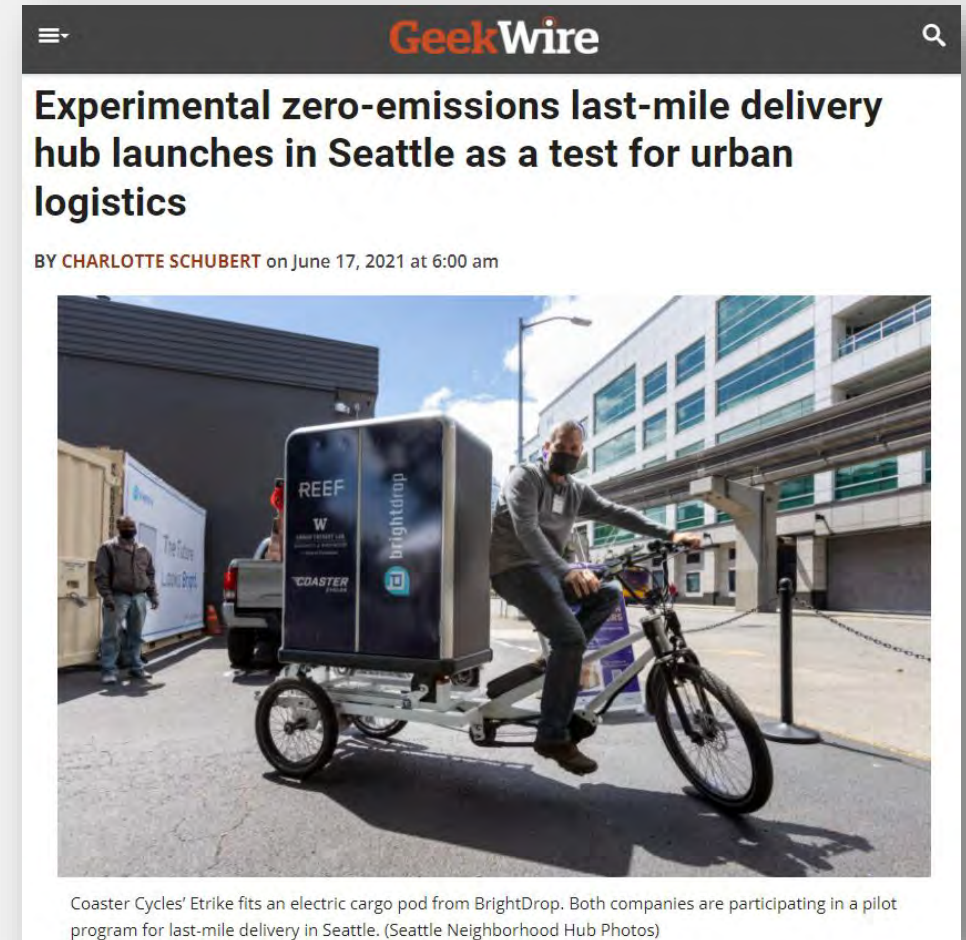
- › Curbspace, off-street, and alleyways

Changed the phrase “illegal parking” to “insufficiency of alternatives”



# Thought Leadership in Urban Freight

- Defined the unique characteristics of urban freight as separate from heavy freight
- Raised the profile of urban freight at the international, national, and regional level
- Framed freight transportation as interconnected with passenger travel
- Demonstrated that a long lasting collaboration between academia, private and public sectors is possible, and results in mutual benefit and accelerates testing and adoption of solutions
- Brought rigorous experimental design to the evaluation of empirical urban freight solutions



# Quantifying Urban Freight



- First to quantify parking cruising for commercial vehicles
  - On average a commercial vehicle spent 2.3 minutes cruising per trip. This corresponds to a 28% of the total trip time on average. A parcel delivery vehicle spends on average 1.1 hours a day cruising.
- First to quantify required space around commercial vehicles required for safe operations
  - 3 feet at front and sides of vehicle
  - 3 feet beyond extension of ramp or lift-gate at rear of vehicle

# Quantifying Urban Freight (Cont'd)

- Bring fleet data to inform policy makers:
  - In Seattle, the vast majority of commercial vehicles are relatively small:
    - 54% are commercial pick-ups and work-vans
    - Additional 30% are single-unit 2-axle vehicles
  - Services account for 30% of all commercial vehicle traffic
- Measuring parking capacity:
  - There is about as much capacity in off-street loading bays and loading docks as there is at the curb in Greater Downtown Seattle





# Measuring Urban Freight Solutions



- Carried out the first pilot of a common locker, and the only studies of common carrier lockers and their impact on regional transportation.
  - 50% drop in average time spent in the building
  - 33% drop in delivery vehicles' dwell time at the curb

- Quantify the benefits of cargo bike deliveries replacing truck deliveries

- E-bikes halved VMT per package compared to trucks
- E-bikes reduced tailpipe emissions by 30% compared to trucks
- E-bikes maintained time spent per package
- 10 trucks could be replaced by seven e-bikes



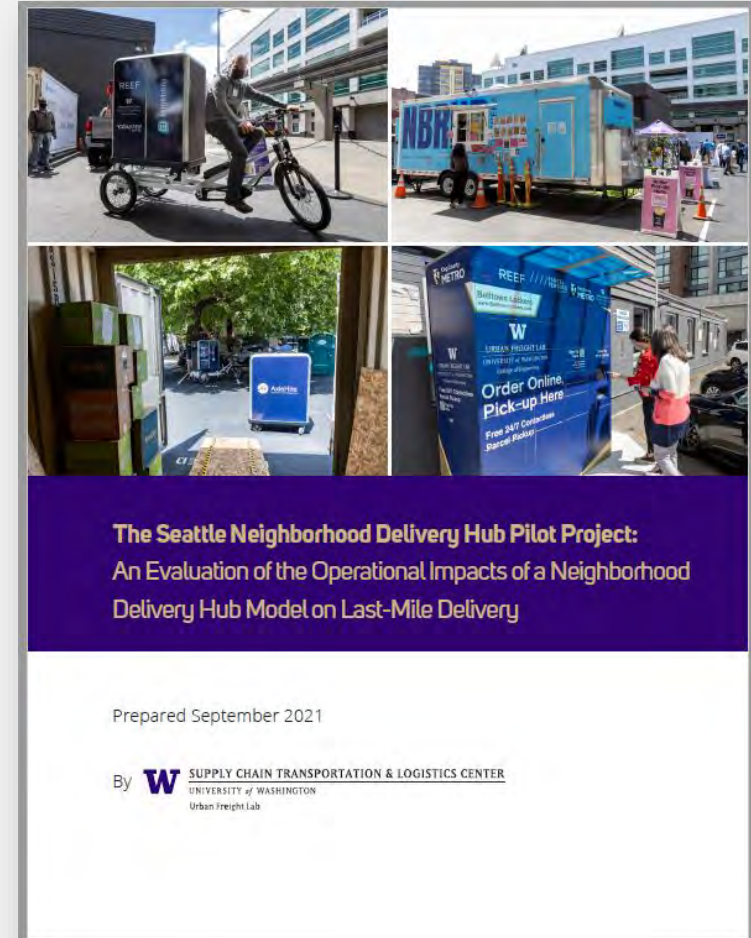
# Products & Impact

**Final Fifty Feet Toolkit:** Built from tools developed for our own research and packaged for easy use by others, these tools help you understand and solve urban freight challenges in your area.

**Research Reports:** All our research projects result in publicly available reports on our website. We want our work to be useful.

**Big Ideas:** Our proximity to both public and private sectors allows us to see boundary breaking solutions. Our technical expertise gives us the tools to figure out how they can work.

**Pilot Tests:** We are committed to implementing practical tests and trials of new solutions. We believe this is an essential component of research in applied engineering.



# Urban Freight Lab Common Microhub Pilot



As one of the nation's first zero-emissions last-mile delivery pilots, the Seattle Neighborhood Delivery Hub served as a testbed for innovative sustainable urban logistics strategies on the ground in Seattle's dense Uptown neighborhood.

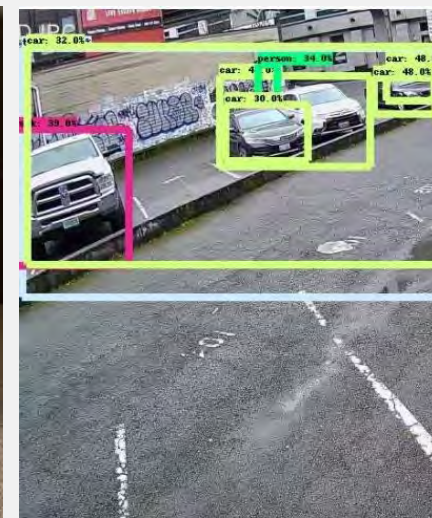
# Background/Motivation

- UFL Members voted in early 2020 and collaboratively chose the microhub as next pilot project
- Opportunity to test and evaluate urban logistics strategies on the ground in Seattle's Uptown neighborhood
- Identify the benefits and costs of hubs in urban delivery systems:
  - Does the hub reduce CO<sub>2</sub> emissions per package?
  - Does the hub reduce the number of truck miles required for delivery?
  - Is the hub's shared cost model cost effective?
- Guide the future development of similar sustainable city logistics solutions around the world



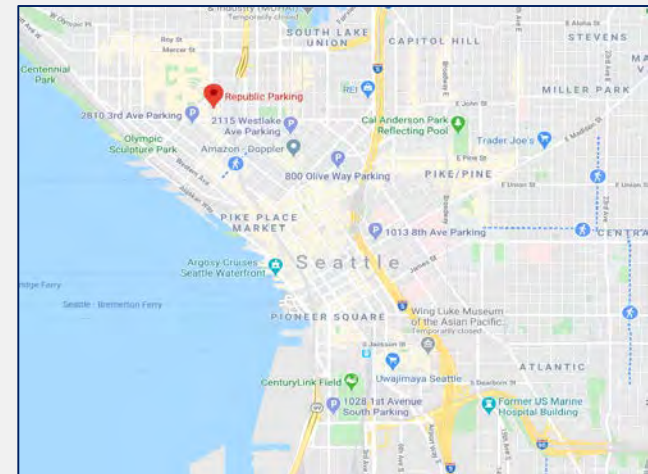
# Partners and Products

- Common Carrier Parcel Lockers: **UFL**
  - ✓ Available for neighborhood residents and commuters
- Ghost Kitchen and MicroHub infrastructure: **REEF**
  - ✓ On-site food preparation and delivery staging
- Last Mile Deliveries: **AxleHire**
  - ✓ Provides last mile services using Microhub as a transshipment point
- Electric-Assist Cargo Bike Fleet: **Coaster Cycles**
  - ✓ Customized electric-assist cargo bikes to carry electric pallets
- Electric Pallet (EP1): **Bright Drop (GM)**
  - ✓ Provides a propulsion-assisted electric pallet for moving goods from a delivery vehicle to a customer's door.
- MUST Sensors: **UW STAR Lab**
  - ✓ Comprehensive edge-computing based sensing and communication device for data collection
- Data Sharing: **SDOT**
  - ✓ 30% zero emission delivery by 2030



# Site Selection Process & Criteria

- Surveyed partners on requirements and preferences for participation
- Identified top requirements:
  - Height Clearance
  - Infrastructure: electricity, WiFi, security, signage
- Identified top preferences:
  - Customer access
  - Proximity to transit, located in mixed use neighborhood
- Utilized information from surveys to conduct site analysis from existing REEF Seattle real estate portfolio



# Microhub Site

Location: 130 5th Avenue North, Seattle, WA

Neighborhood: Uptown

Surrounding Area: Residential/Tourist

Lot Type: Surface Lot

Number of Stalls: 30

Additional Benefits:

- REEF Ghost Kitchen live on site
- Access to Queen Anne/Seattle Center/Uptown area
- Access to 99 Ramp (North & South)



# Project Timeline

**Summer 2020**  
Project partners established & site selected



**April 5, 2021**  
E-bike deliveries started

**Early 2020**  
UFL members identify project



**March 2021**  
UFL locker started operation



**May 26, 2021**  
Microhub Launch

**July 23, 2021**  
Closing date

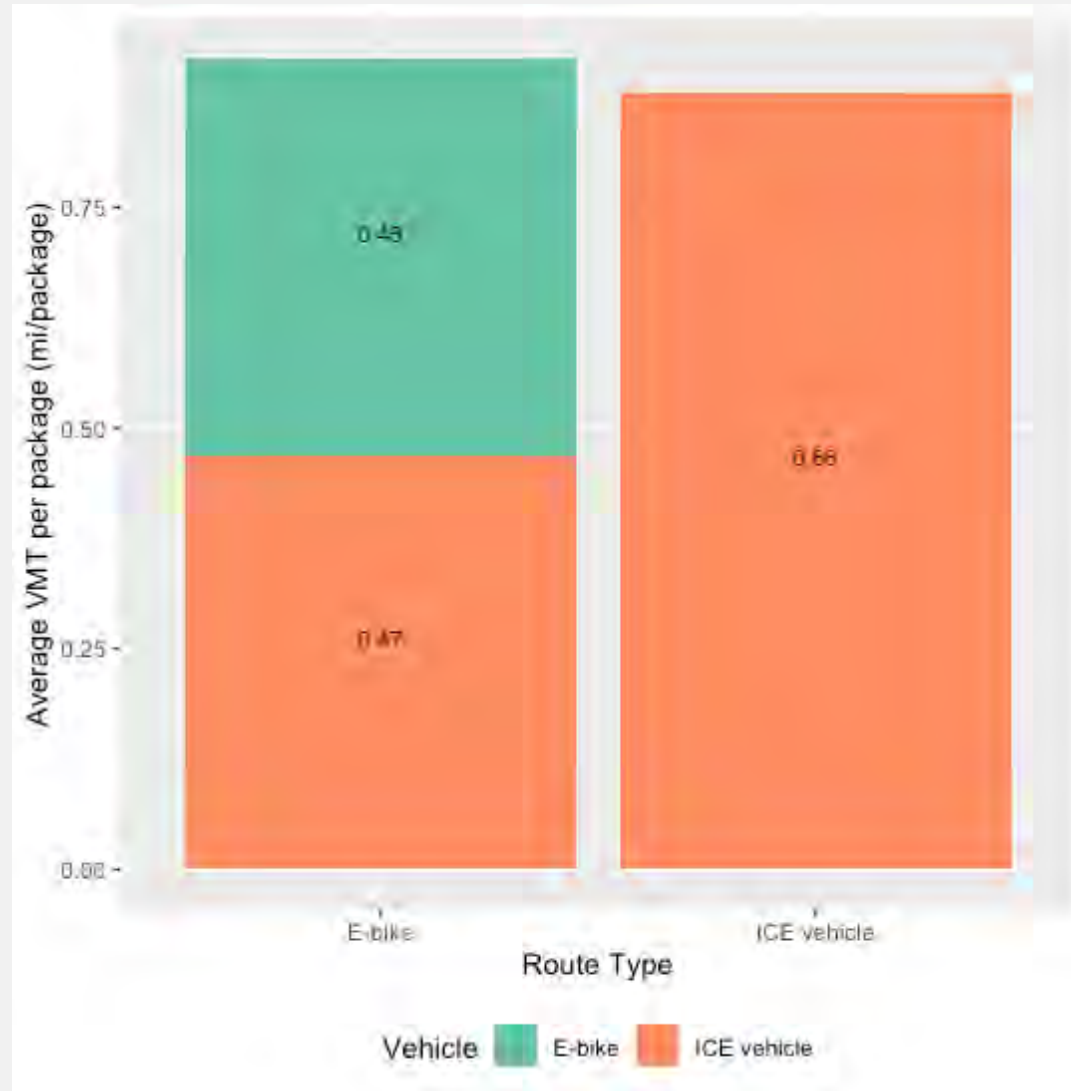


# Objective of Analysis

- Objectives set by microhub project team
- Assess the performance of delivery microhubs and cycle logistics when compared with truck deliveries in terms of:
  1. VMT per package,
  2. Tailpipe CO<sub>2</sub> emissions,
  3. Time spent per package.



# Empirical Results from the Pilot Test

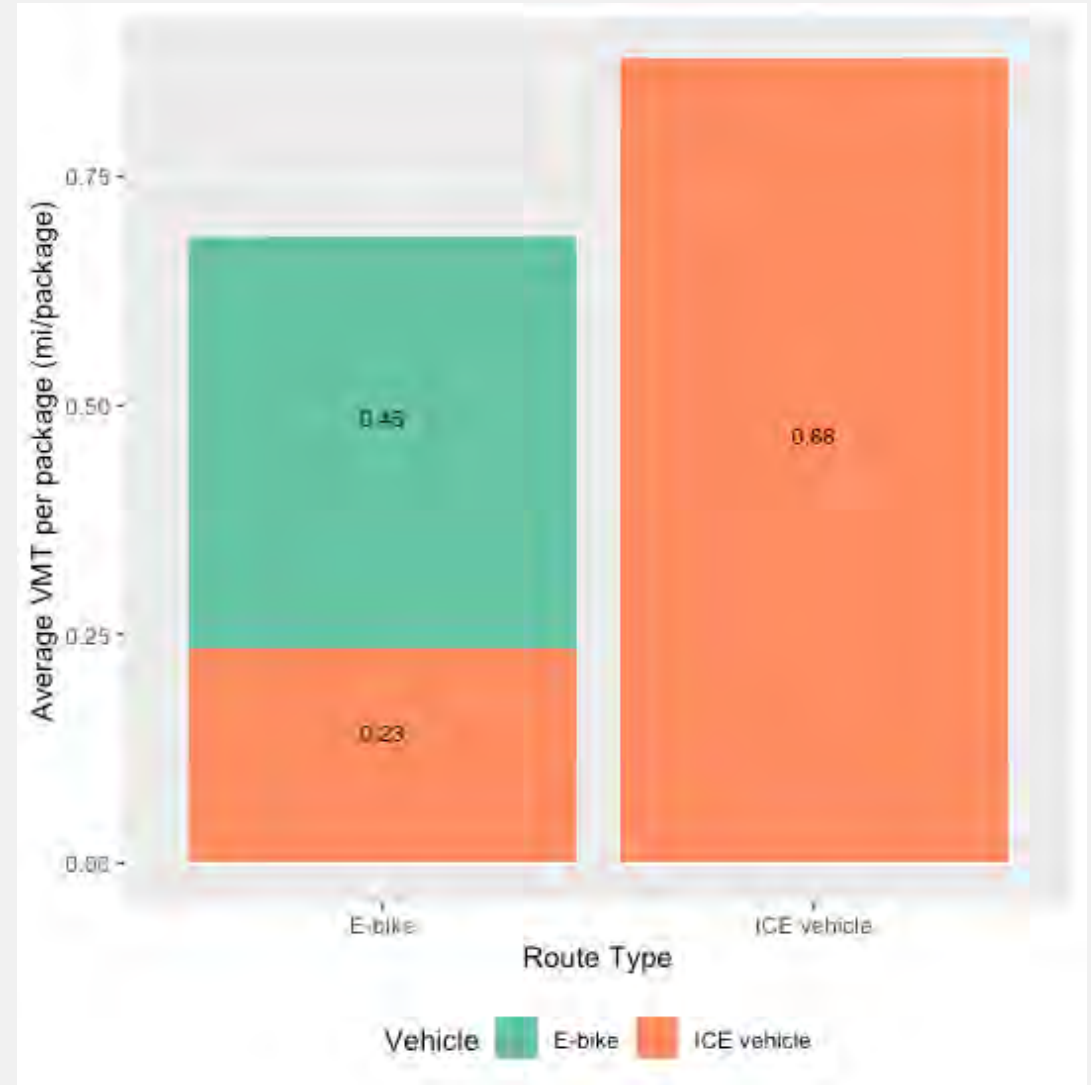


# 50%

E-bike solution produces half the ICE vehicle miles travelled per package

# Empirical Results from the Pilot Test (cont'd)

1 bike  
mile = 1.4 truck  
miles

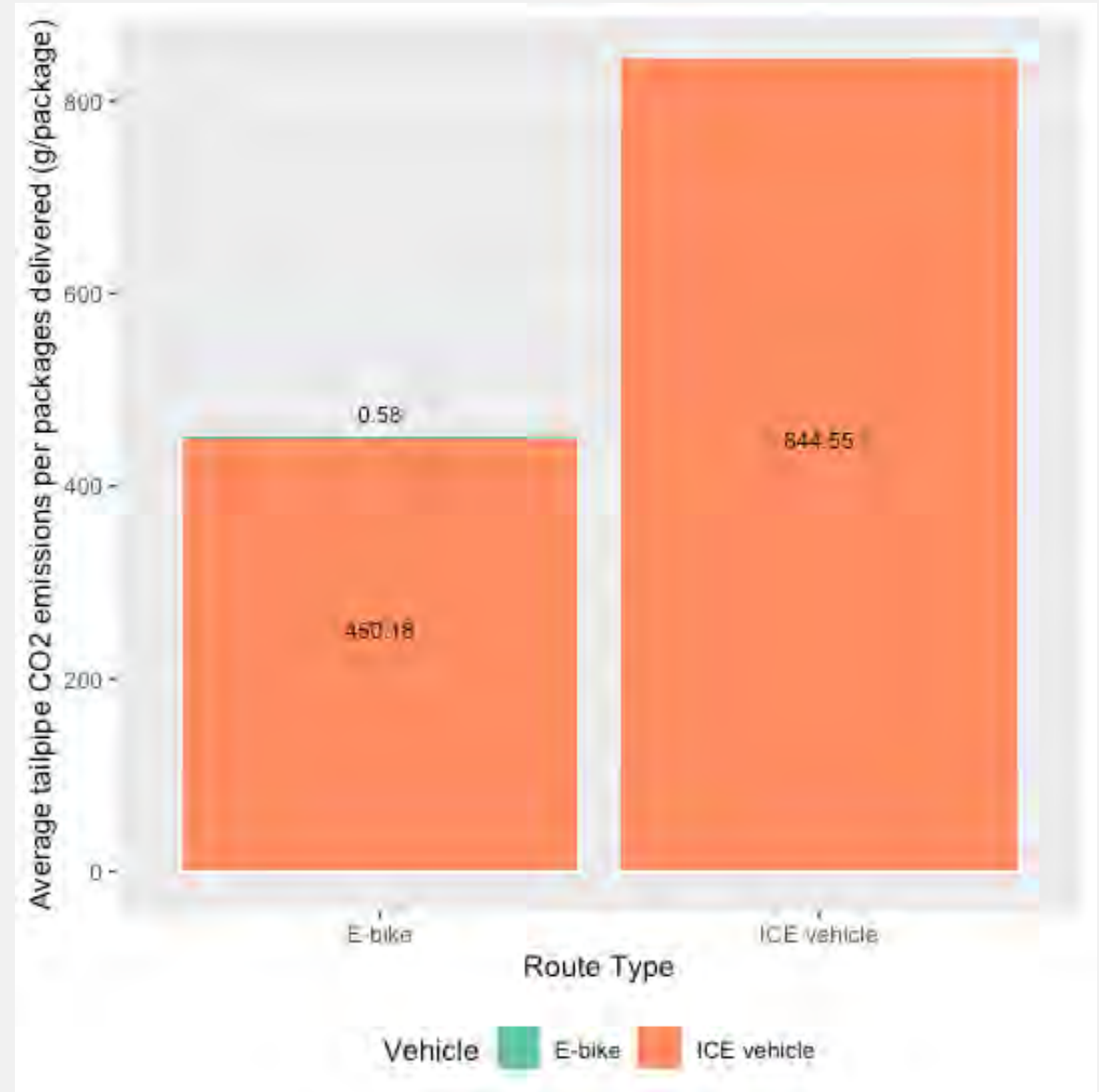


\*If e-bikes were operating 8 hours a day (completing 4 routes)

# Empirical Results from the Pilot Test (cont'd)

30%

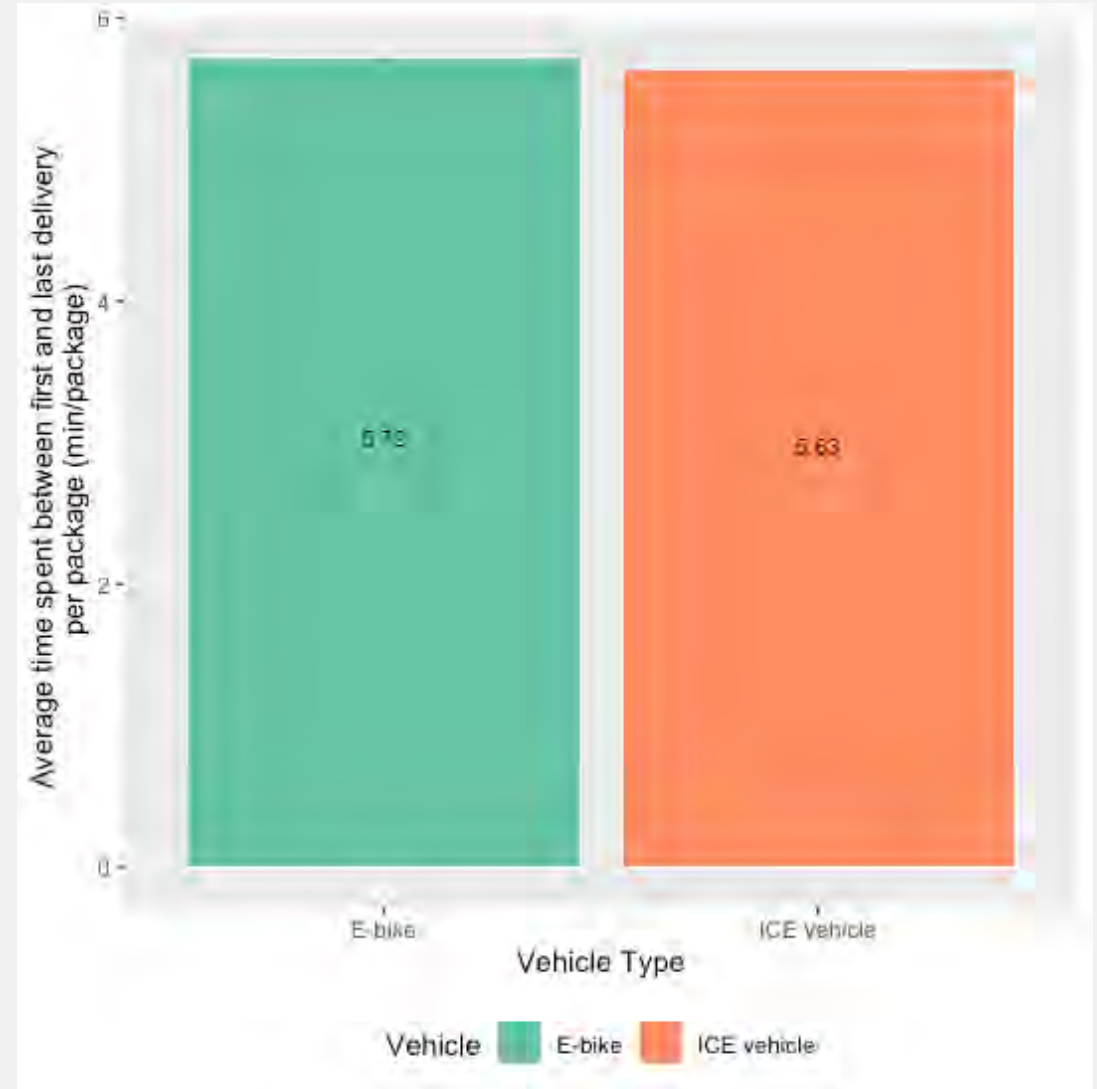
Reduction in tailpipe emissions per package using E-bike solution.



# Empirical Results from the Pilot Test (cont'd)

0

Increase in time per package



\* excludes the trip duration to and from the microhub

# Summary







- There has been a tectonic shift in how freight moves in our cities and neighborhoods
- Cities, transportation agencies, and planners are unprepared to manage this change
- The Supply Chain Transportation and Logistics Center's Urban Freight Lab is a Washington State innovation that has
  - Engaged private sector and community groups
  - Produced results to get us ahead of this change
  - Supports more sustainable communities **and** a more vibrant freight system

# Policy Recommendations

- The legislature should provide annual funding on the order of \$250K to:
  - Support cities and regions as they manage and mitigate urban freight impacts
  - Align approaches with business interests and growth
  - Support locations outside of densest urban areas
  - Engage communities and to improve equity and access



# Questions?

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