



Dockless Mobility Vehicle Permit Pilot Program

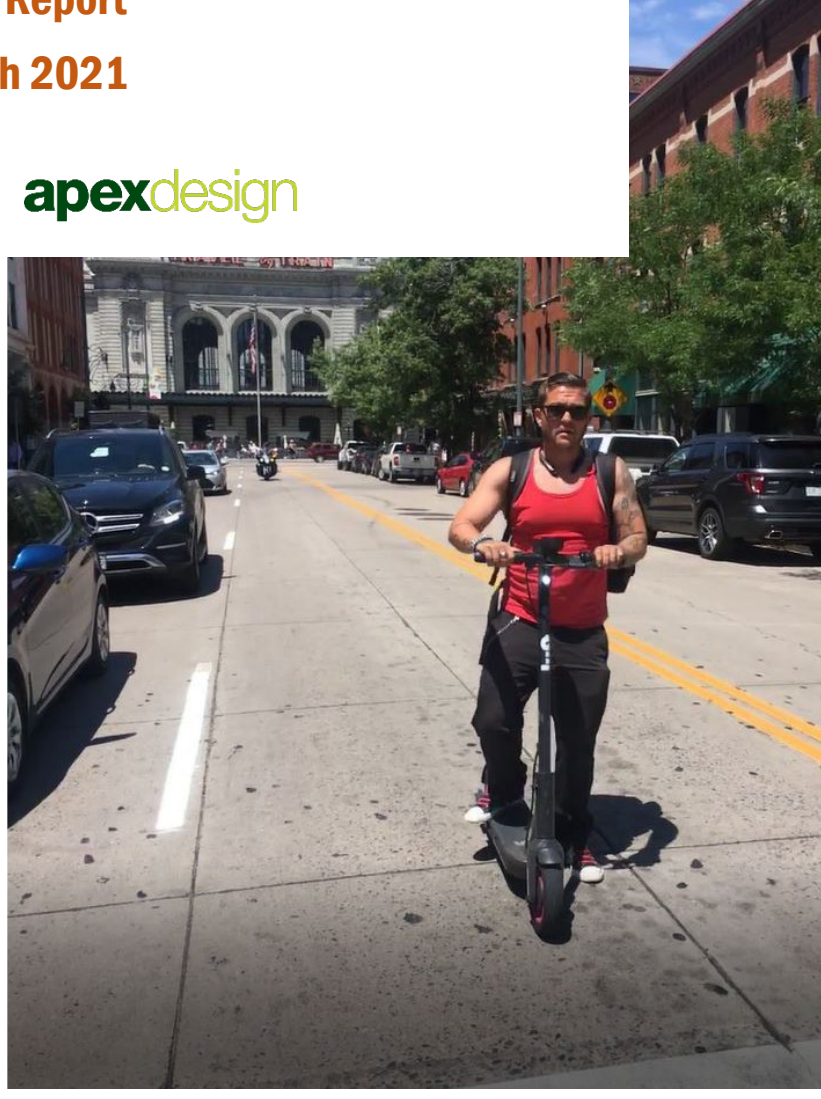
Final Report

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DENVER
THE MILE HIGH CITY

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Introduction

Dockless & New Mobility Background

Scooters first appeared on a large scale in Denver in May 2018, when two scooter operators deployed their fleets without authorization from Denver’s Department of Transportation & Infrastructure or DOTI (formerly Denver Public Works). In June, DOTI ordered scooter operators to suspend their operations in the public right of way while the Dockless Mobility Pilot Permit Program was developed.

When scooters first became commonplace on Denver streets, they were classified under state law and city ordinance as “toy vehicles,” which precluded their operation in the street or bicycle lanes. Initial public feedback was strongly against the resulting sidewalk scooter operation due to the distinct difference in speed that the vehicles could travel versus that of a pedestrian, and, as a response Denver City Council adopted an ordinance in January 2019 that permitted scooter use in bicycle lanes and roadways pending the roadway speeds. In addition, the ordinance language specified conditions for sidewalk use including a maximum speed allowance. As the permit program nears an end and DOTI looks to next steps, the department is committed to further public outreach and education initiatives to help the seamless integration of all new mobility options into the transportation fabric of Denver for the health, safety and welfare of all users.

Pilot Program Summary

Denver’s Dockless Mobility Pilot Permit Program launched in July 2018 to guide the use of commercial scooters and e-bike fleets within the City and County of Denver’s public right of way. This program was developed in coordination with Denver Parks & Recreation (DPR), the Denver Police Department (DPD), Denver Department of Public Health & Environment (DDPHE), the Regional Transportation District (RTD), business improvement districts, dockless operators, elected officials, and the general public.

The pilot permit program is guided by DOTI’s Rules and Regulations for the existing Transit Amenities Program (TAP), which permits commercial activity on the public right-of-way in exchange for amenities that support transit usage. The TAP provides the City with an opportunity to test commercial scooter and e-bike fleets for their ability to meet citywide mobility goals including to provide flexible, affordable, and accessible multi-modal transportation options for all. The City’s [Mobility Action Plan](#) goals are to:

- **Accelerate Safety Improvements and Robustly Pursue Vision Zero:** Reduce traffic fatalities and serious injuries by creating safer streets to help save lives
- **Deliver a Multi-Modal Network that Encourages Mode Shift:** Reduce single-occupant vehicle (SOV) commuters to 50 percent and increase the percentage of bike and pedestrian commuters to 15 percent and transit commuters to 15 percent.
- **Embrace Innovative Policies, Technologies, and Strategic Partnerships:** Embrace innovations in policy and technology and leverage new partnerships to build both connective and informational networks that eliminate barriers and give all people access to opportunity.
- **Protect the Climate and Improve Public Health:** Increase access to cleaner and healthier transportation choices to reduce greenhouse gas emissions.
- **Improve Funding, Planning, Organizational Structure, and Public Involvement:** Invest at least \$2 billion between now and 2030 in mobility projects and services.



In addition, DOTI identified six vision statements to explore and test throughout the pilot program:

- Test new innovations and their ability to meaningfully meet citywide mobility goals
- Implement programs that respect safety and infrastructure
- Increase percentage of people who have access to and take public transit
- Provide accurate communication and guidance to users
- Scale responsibly based on performance metrics
- Integrate new services seamlessly with city’s transportation system
- Serve the communities that are most vulnerable and increase their access to smart technology

The pilot program was initially limited to no more than five dockless scooter operators with a maximum fleet size of 350 vehicles each, and five dockless bicycle operators with a maximum of 500 vehicles each. Operators wishing to deploy the maximum number of vehicles were required to deploy at least 100 vehicles outside of the Central Business District in “opportunity areas,” which are designated areas based on data indicators including income, access to transit, and vehicle ownership statistics.

Under the pilot permit program, commercial fleet sizes were allowed to dynamically adjust in regulated quarterly steps throughout 2019. In February, April, and July of 2019, each operator was permitted to increase their permitted fleet size by 25% provided they met an operational requirement over the preceding three months (≥ 3 rides/vehicle/day for scooters, or ≥ 1 ride/vehicle/day for bicycles and e-bicycles).

As of July 1, 2019, DOTI issued five scooter operator permits and two bicycle/e-bicycle operator permits. This information is detailed in the tables below:

Scooter Permits

Operator	Deployment Date	Initial Permitted Fleet Size	Final Pilot Fleet Size
Bird	August 2018	350	684
Lime	August 2018	350	684
Lyft	September 2018	350	684
Razor	October 2018	350	350
Spin	October 2018	115	438

Bicycle & E-Bicycle Permits

Operator	Deployment Date	Initial Permitted Fleet Size	Final Fleet Size
Jump	September 2018	500	500*
Lime	November 2018	500	<i>No longer operating</i>

*Jump’s operations were acquired by Lime in May 2020 and continued to operate

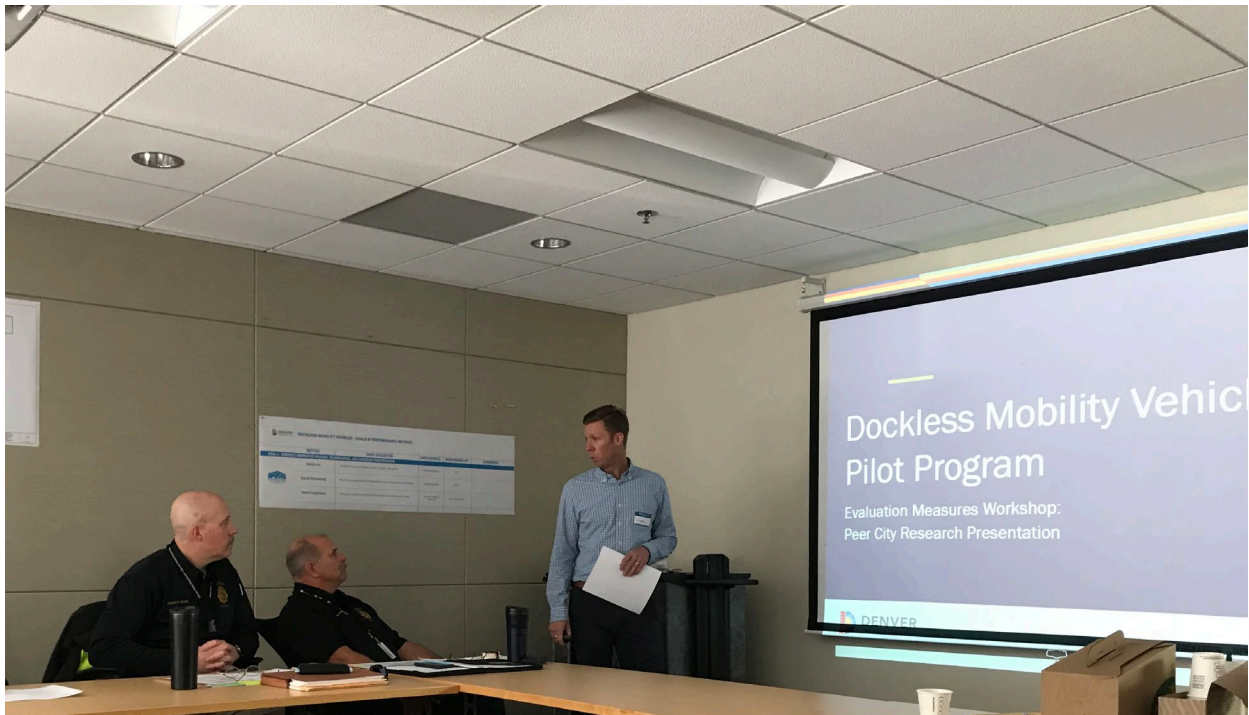
In order to better integrate the dockless vehicles with the existing transportation system, permitted operators were encouraged to deploy their vehicles to areas near transit stops at the beginning of each day. Vehicles then circulated freely throughout the day following this initial deployment requirement.



Project Purpose

The purpose of this report is to understand the impacts of the Dockless Mobility Pilot Permit Program using research, observation data collection, public input, operator data analysis, as well as information provided by partnering agencies. This report includes data collection and analysis findings, and conclusions based on lessons learned throughout the pilot. The evaluation metrics are based on Denver's Mobility Action Plan goals and were developed by the project team and a stakeholder workshop, which included the Denver Police Department, Bicycle Colorado, Denver Streets Partnership, Auraria Higher Education Center, University of Denver, RTD, Downtown Denver Partnership, and City and County of Denver staff.

Stakeholder Workshop



Data Collection Methodology

The Dockless Mobility Pilot Permit Program evaluation included data collected through online and intercept surveys, field observations, and operator data reports. Data collected was determined based on the evaluation metrics depending on availability and level of effort.

Online Survey

The online survey was available on the City and County of Denver's project website. The online survey asked questions specific to each dockless vehicle type; scooter or e-bike. Questions about each dockless vehicle were identical, the only difference was the wording of the questions pertaining either to scooters or e-bikes. The survey was 25 questions long, including seven questions about the respondent's demographics such as age, gender, and household income. Other questions, pertaining to the respondent's experience, asked about:



- Frequency of riding dockless vehicles
- Reason for riding dockless vehicle
- Shift in use from other modes of transportation
- Availability of dockless vehicles
- Experience with specific companies
- Understanding of rules and ordinances
- Overall impression of dockless vehicles
- Dockless vehicle encounters and collisions
- Demographic information (age, gender, household income, zip code)

This report analyzed the 2,708 responses received from the start of the survey on January 14, 2019 through March 31, 2019. Responses included 1,282 (47.3%) respondents that ride scooters, 142 (5.2%) respondents that ride e-bikes, and 1,284 (47.4%) respondents that did not ride either type of dockless vehicle. The online survey remained open until the completion of the pilot program at the end of August 2019. Complete findings from the online survey results through March 31, 2019 can be found in Appendix B.

Intercept Surveys

Intercept surveys were conducted by consultant team members within Downtown Denver, asking people about their experience with dockless vehicles. Survey responses were collected at various times of day, typically between 9AM and 3PM.

The intercept survey was a shortened version of the online survey. The intercept survey asked 12 questions pertaining to destinations reached on a dockless vehicle, transportation mode replacement, transit connections, and incentives to encourage riding. Fifty-two individuals completed the intercept survey between February and April 2019. This included 29 (56%) scooter riders, 2 (4%) e-bike riders, and 21 (40%) non-riders. Complete findings from the survey results can be found in Appendix C.

Field Observations

User Behavior

User behavior data was collected through field observations throughout the pilot program during the AM peak, mid-day peak, and PM peak hours at several locations throughout the Downtown Denver area. Ten locations were identified to collect observational data; however the majority of data was collected at four locations based on higher dockless vehicle activity. The four locations also included various types of intersections such as:

- A signalized intersection with no bike lanes
- A signalized intersection with bike lanes and a WALK signal for pedestrians
- A non-signalized intersection with stop signs and bike lanes
- A non-signalized intersection with stop signs and a shared use sidewalk

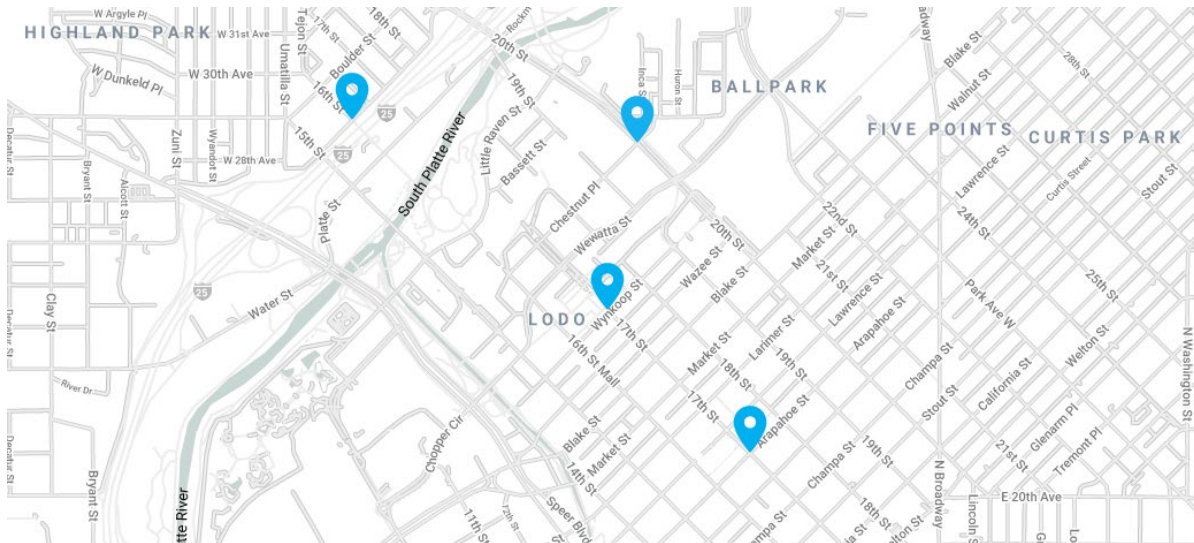
Primary Intersection Locations:

- 17th Street & Wynkoop Street
- 20th Street & Chestnut Street
- 16th Street & Central Street



- 17th Street & Arapahoe Street

Primary Field Observation Intersection Locations



Observations included the following:

- Dockless vehicle (scooter or e-bike)
- Number of dockless vehicles observed
- Gender of rider
- Location of use (sidewalk, bike lane, travel lane)
- Direction of travel
- Helmet use
- Yielding behavior (e.g. yielding to pedestrians on the sidewalk by maneuvering around, slowing down, or stopping to give the pedestrian the right-of-way)
- Near misses and/or collisions
- Signal compliance (arrival on red, dockless vehicle user stopping and waiting)
- Stop sign compliance (dockless vehicle user stopping at stop sign and waiting until safe to proceed)
- Anecdotal observations

A total of 91 hours of user behavior data were collected between December 2018 and April 2019, and a total of 1,906 scooters and 158 e-bikes were observed. See “Dockless Mobility Findings” section below for a report out on compliance at these intersections.

Parking Compliance

Parking compliance was collected through field observations during the mid-day time period in the Downtown Denver area. Observations were collected through Esri ArcCollector, a geolocation software that allows the data collector to create a data point using preset options and take a photo associated with the data point.

The following fields were collected along with a photo of each non-compliant vehicle:

- Vehicle Type (scooter or e-bike)
- Compliant (Yes – in the amenity zone, or near a building; No – too close to the curb, in the walk zone, or blocking access)



- Upright (yes or no)
- Parking compliance near transit stops by users was recorded when observed. Operator transit stop deployment compliance was captured by the City's enforcement staff during random morning checks.

Members of the project team processed the data points created in ArcGIS online and created visual maps of the data points for analysis. A total of 286 parked dockless vehicles were observed between February and April 2019. Of these, 227 were scooters and 59 were e-bikes.

Dockless Mobility Findings

The following findings are based on data collected between December 2018 and April 2019. It is important to note that the observational and survey data was collected during late winter and early spring, and may not reflect behavior during warmer weather periods. The number of scooter rides has been shown to increase as the weather warms, and additional data collection and reporting will continue moving forward.

Performance Evaluation Metrics

Goal 1: Accelerate Safety Improvements and Robustly Pursue Vision Zero

Collisions

Measure: Number of collisions and near misses

Data Source: Field Observations, DPD Reports, Denver Department of Public Health & Environment and Denver Public Health

A guiding vision element of the pilot was to implement a program that respects safety. Data on collision, injuries, and perception of safety was collected to understand the impact of dockless vehicles on safety and the City's Vision Zero goals.

Findings:

- 7 near misses were observed during 91 hours of user behavior field observations
- 55% of online survey respondents reported that they had an interaction with a scooter rider where they had been hit or almost hit. Of those, 82% reported they had been walking during this interaction.
- 37% of intercept survey respondents reported that they had an interaction with a scooter rider where they had been hit or almost hit. Of those, 11% reported they had been walking during this interaction.
- 3% of online and 7% of intercept survey respondents reported they had ridden a scooter while under the influence of alcohol and/or drugs.
- Less than 1% of scooter riders were observed wearing a helmet while riding the scooter. Helmets are not required under Colorado law and thus were not a requirement of the pilot program.
- Additional research may be needed to understand and compare injury rates between scooters and other road users, including people on foot and on bikes.



Parking Compliance

Measure: Number of dockless vehicles properly and improperly parked

Data Source: Field Observations and Online Survey

Observations of dockless vehicle parking locations were studied to understand the potential impact of dockless vehicles in the public right of way to the mobility of other users in the public right of way, in particular, people with disabilities, pedestrians, users of loading zones, and people boarding or exiting transit vehicles.

Findings:

- 89% of e-bikes and 78% of scooters observed were parked properly
- 18% of scooters were parked too close to the curb and 4% were blocking access
 - Scooters parked too close to the curb may be due to lack of sidewalk width
 - Some scooters parked too close to the curb may potentially be blocking access to the bus at stops
 - From observations, scooters are sometimes rebalanced and placed too close to the curb
- 92% of online survey scooter rider respondents reported that they knew where to park a scooter properly

Other Notes:

- It was observed during morning data collection that, in many cases, operators were deploying too far from transit stops and too close to the curb
- In the afternoons, fewer issues related to deployment were observed. Though in some cases, vehicles were deployed too close to curb and blocking access due to right of way space constraints

Examples of Improperly Parked Scooters



4%

**Blocking
access**

18%

**Too close to
the curb**



Traffic Compliance

Measure: Number of dockless vehicles compliant and non-compliant with red traffic signals, stop signs, and riding direction of travel and bike lanes.

Data Source: Field Observations

Traffic compliance was observed to understand how dockless vehicles integrate with the city's transportation system and the impacts on safety for all users.

Findings:

- 38% of all scooter riders observed at a stop sign were compliant and stopped, while 62% did not comply with the stop sign
- 63% of all scooter riders observed stopped at a traffic signal when it turned red, while 37% proceeded through the signal on red
- 89% of scooter riders observed riding in a bike lane were traveling in the correct direction, while 11% were observed riding in the wrong direction
- 94% of scooter riders observed riding in a travel lane were traveling in the correct direction, while 6% were observed riding in the wrong direction

Scooter Users Riding in the Bike Lane and Stopped at a Red Signal





Goal 2: Deliver a Multi-Modal Network that Encourages Mode Shift

First & Final Mile

Measure: Number of people who use dockless vehicles as part of a transit trip

Data Source: Online Survey and Intercept Surveys

The distance between a destination and the closest transit stop may be longer than a comfortable walking distance and require an additional mode of travel. Survey responses were used to understand the potential impact of dockless vehicles to increase the number of people who have access to and take public transit.

Findings:

- 44% of online and 67% of intercept survey respondents never ride a scooter in connection with transit
- 36% of online and 20% of intercept survey respondents ride a scooter in connection with transit occasionally but less than once a week
- 20% of online and 13% of intercept survey respondents ride a scooter in connection with transit at least once a week

Other Notes:

- The RTD transit agency has a license agreement with operators for district wide access of their station areas for dockless mobility parking with additional data requirements.

Scooters Parked at a Light Rail Station





Trip Distance

Measure: Average dockless vehicle ride distance

Data Source: Operator Reports, MDS Data

The distance that dockless vehicles are ridden provides information about the types of trips that are taken using a dockless vehicle.

Findings:

- Over **7,300,000 miles** have been ridden on scooters since the start of the pilot program, with the average trip length of 1.2 miles
- Over **512,000 miles** have been ridden on dockless e-bikes since the start of the program, with an average trip length of 1.57 miles

Trip Replacement

Measure: Number of dockless vehicle rides that replace automobile trips

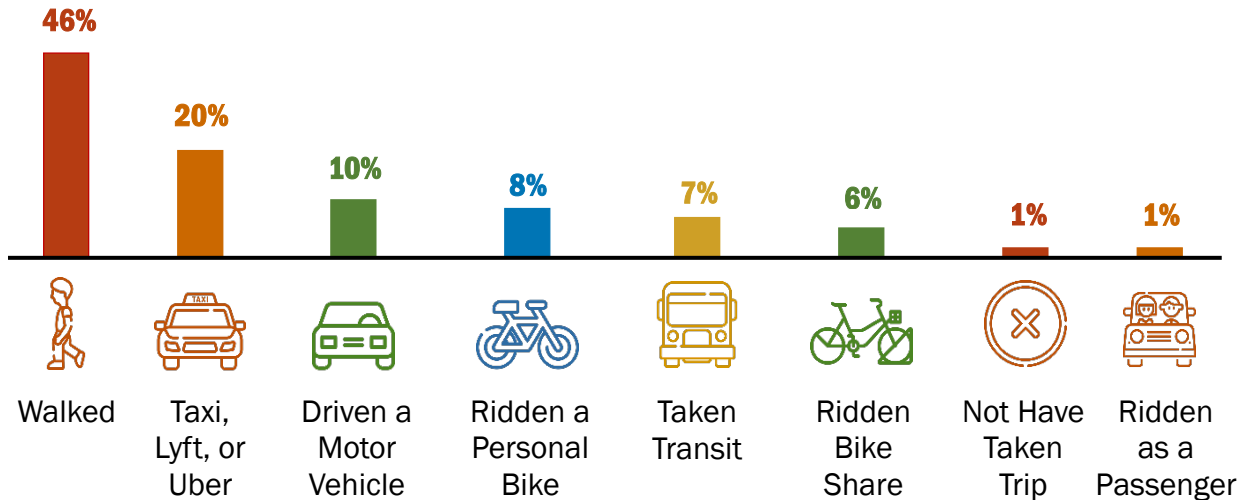
Data Source: Online Survey and Intercept Surveys

Trip replacement is measured to understand potential impact of dockless vehicles on Denver’s Mobility Action Plan goal of reduction in single-occupant vehicle (SOV) use and mode shift increases.

Findings:

- 31% of scooter trips ridden by online survey respondents replaced automobile trips
- 27% of scooter trips ridden by intercept survey respondents replaced automobile trips
- If 30% of all scooter trips ridden during the pilot replaced automobile trips, this would equate to a reduction of around 400,000 automobile trips and about 570,000 vehicle miles traveled.

Online Survey Question: Think about your last scooter ride in Denver. If a scooter had not been available, what is the most likely way you would have traveled instead?





Vehicle Accessibility

Measure: Number of readily available dockless vehicles in the system

Data Source: Operator Reports, Online Survey, and Intercept Surveys

A strategic goal in Denver’s Mobility Action Plan is to provide more transportation choices, including shared vehicles. A shift in travel behavior requires alternative modes of transportation to be readily available when and where a user needs them.

Findings:

- 34% of online survey respondents reported that they found a dockless scooter right away and 7% reported they could not find a scooter before giving up. The remaining respondents reported they had to walk one or more blocks, check one or more companies, or check one or more scooters to find an available and properly functioning scooter.
- 47% of intercept survey respondents reported that they found a dockless scooter right away and 6% reported they could not find a scooter before giving up. The remaining respondents reported they had to walk one or more blocks, check one or more companies, or check one or more scooters to find an available and properly functioning scooter.
- 24% of intercept survey respondents said that “more vehicles available where I need them” would encourage them to use dockless vehicle more often.

Vehicle Use

Measure: Number of rides per vehicle per day in the system

Data Source: Operator Reports

The City considers utilization rates and whether these rates demonstrate latent demand in determining adjustments to permitted fleet sizes.

Findings:

- Over 6.1 million rides on scooters, with an average of 6,700 rides per day
- Over 325,000 rides on dockless E-Bikes, with an average of 357 rides per day
- Scooter rider respondents to the online survey listed their main reasons for choosing to ride a scooter as it was a “less expensive” and the “fastest option.”
- Scooter rider respondents to the intercept survey listed their main reasons for choosing to ride a scooter as it was the “fastest option” and “it was fun.”

Goal 3: Embrace Innovative Policies, Technologies, and Strategic Partnerships

System Rebalancing

Measure: Percent of vehicles rebalanced at the beginning of the day to transit stops per program overview

Data Source: Operator Reports

The location of vehicles at the beginning of the day is used to understand the potential of dockless vehicles to increase the number of people who have access to and take public transit.



Findings:

- At 7am, 32% of all scooters and 20% of all electric/pedal-assist bikes were within high activity transit areas.
- At 8am, 36% of all scooters and 20% of all electric/pedal-assist bikes were within high activity transit areas.

Other Notes:

- DRCOG and RTD have both been partners throughout the Dockless Mobility Vehicle Pilot Program providing strategic coordination and recommendations. DRCOG has established a multi-agency Micromobility Working Group that meets monthly.

Permit Compliance

Measure: Evaluation of permittee commitments to share data and pay permit fees

Data Source: Operator Reports

The timeliness of operators to provide the data required as a condition of their permits and pay permit fees, as well as the format and ease of use of the data provided, was studied to inform the development of a potential ongoing program.

Findings:

- For most of the pilot, Denver utilized the Mobility Data Specification (MDS) standard developed by the Los Angeles Department of Transportation, which has widely become the standard across cities who have initiated dockless programs or pilots.
- Denver data analysts worked throughout the pilot's duration to establish data connections with the scooter operators that allowed near real-time access to ridership data.

Goal 4: Protect the Climate and Improve Public Health

Active Transportation

Measure: Number of scooter rides that replace active transportation trips such as walking or biking

Data Source: Online Survey and Intercept Surveys

Survey responses are used to understand the potential impact of scooters on active transportation trips (healthy activities) such as walking and riding a bike.

Findings:

- 72% of intercept survey respondents reported that their last scooter trip had replaced a walk trip. None reported that it had replaced a bike trip.
- 46% of online survey respondents reported that their last scooter trip had replaced a walk trip and 14% that it had replaced a bike trip.
- If 60% of all scooter trips ridden during the pilot replaced active trips, that would equate to about 1.1 million miles and 800,000 trips not walked or biked.



E-Bike Rider



Equity

Measure: Number of dockless vehicle rides that originate in Areas of Opportunity

Data Source: Operator Reports

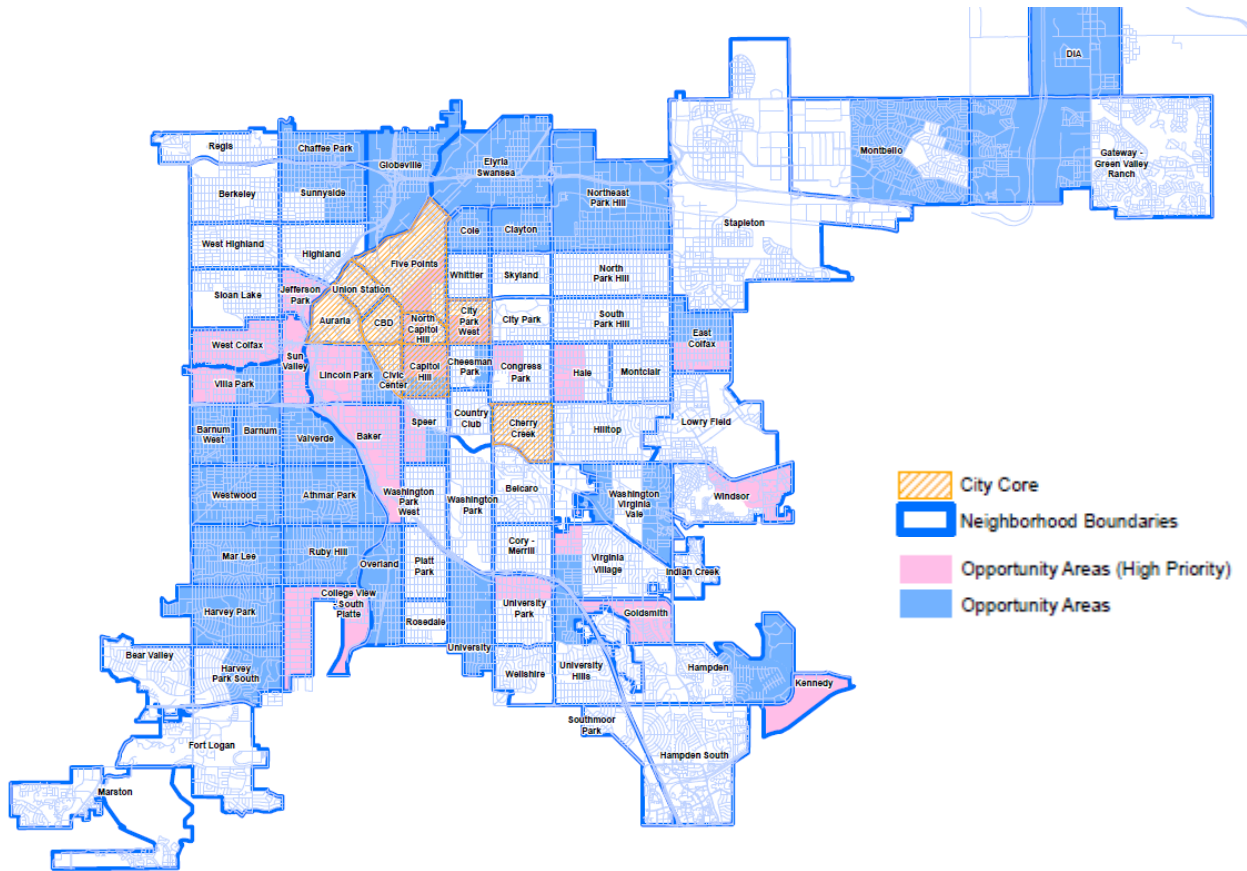
The location of dockless vehicles at the beginning of the day is used to understand the potential of dockless vehicles to serve the communities that are most vulnerable and increase their access to smart technology. Opportunity areas were selected based on several factors, including income, access to transit, and vehicle ownership statistics and are designed to incentivize a more equitable distribution of vehicles and to provide residents in these areas with more mobility choices.

Findings:

- The Pilot Program Overview (June 2018) requires that 29% of scooters and 20% of e-bikes need to be deployed within designated opportunity areas. The Dynamic Fleet Sizing Policy (February 2019) requires that 33% of scooters and 26% of bikes need to be deployed within designated opportunity areas.
- During a sample day, at 7am, 35% of all scooters and 30% of all e-bikes were deployed within Areas of Opportunity.
- During the same sample day, at 8am, 33% of all scooters and 30% of all e-bikes were deployed within Areas of Opportunity.



Areas of Opportunity Map



Climate Impact & Carbon Footprint

Measure: Emissions reductions and dockless vehicle lifespan

Data Source: Operator Reports

Transportation represents nearly 30% of carbon emissions in Denver and is a leading source of air pollution. The emission reduction by dockless vehicle use and the carbon footprint of the dockless vehicles is used to understand the potential of dockless vehicles to help progress towards the Mobility Action Goal of reducing greenhouse gas emissions 80% by 2050.

Findings:

- If 30% of scooter trips replaced automobile trips, it would equate to around 570,000 automobile miles traveled, or 208 metric tons of carbon dioxide equivalent (mTCO₂e) in direct emissions reductions from the scooter trips. In 2017, there was a total of 5,615,074,551 vehicle miles traveled (VMT) in the City and County of Denver.
- Additional research may be needed to understand the potential climate and public health impacts from dockless vehicles. Considerations include emissions reductions from the complete multi-modal system that may be enhanced by short trip connectors like scooters, the additional miles traveled to redistribute and recharge vehicles, and the electricity used when scooter trips replace energy-neutral walking or bicycling trips.



Goal 5: Improve Funding, Planning, Organizational Structure, and Public Involvement

Public Perception

Measure: Public perception of the dockless mobility program

Data Source: Online Survey

Survey responses are used to understand the ability of dockless vehicles to meaningfully meet citywide mobility goals and guide the development of a potential ongoing program.

Findings:

- Overall, 56% of respondents have a positive impression of scooters, 41% negative, and 3% neutral
- 96% of scooter riders have a positive impression of scooters, 3% negative, and 1% neutral
- 19% of non-riders have a positive impression, 77% negative, and 4% neutral

Conclusion

The Dockless Mobility Pilot demonstrated that dockless vehicles have the potential to advance Denver's mobility goals given the total number of miles traveled and the evidence of single occupancy vehicle replacement. However, dockless vehicles also create challenges. Shifting from a pilot, permit-based program to a longer-term, license-based program selected through a Request for Qualifications (RFQ) allows the city to take a more selective approach to finding the best operator(s) to assist the city in meeting the goals laid out in the Mobility Action Plan.

Additionally, with the departure of the B-Cycle program, it is imperative that bicycles/e-bicycles continue to play a part in Denver micromobility landscape. While considerably less popular than scooters, their longer average distance per-ride suggests they fill a gap for longer trips, and the less novel nature of bicycles may suggest that the trips are more likely to be for a transportation/commuting purpose than an entertainment purpose. This hypothesis may become less accurate as scooters become more accepted and less novel, but based on Denver's strong history with shared bicycles, the decision was made to require scooter operators applying for Denver's RFQ to propose both scooters and bicycles/e-bicycles as part of their proposed operation.

After more than two-and-a-half years, micromobility in general and scooters in particular have become more commonplace in Denver and across the country (and world). But the safety of riders and non-riders continues to be a critical challenge. Additionally, although operators have refined their deployment processes and user education methods, proper parking of dockless micromobility vehicles is an additional challenge, especially for those with special accessibility needs. Denver's RFQ required proposers to outline robust user education and operation processes to minimize the impact of improperly ridden and parked vehicles. The resulting license will include incentives/disincentives to encourage the same.

Over the course of Denver's Dockless Mobility Pilot Permit Program, riders have traveled more than 6.4 million miles—the equivalent of almost 32 trips to the moon. But despite the popularity of this mode, it remains incumbent upon the city to regulate the vehicles in a manner that encourage safe usage and considerate parking. Denver's license for its longer-term program attempts to do this, but also leave flexibility to react to new developments in this fast-growing, ever-changing transportation space.