Agenda

• Project Overview
• Revised Methodology/Criteria
• Scoring by Technology
  • Automated Shuttles
  • Micromobility
  • Mobility on Demand
  • Microtransit
  • Mobility as a Service
• Results
• AvCo/Denver South
• Discussion/Questions
Purpose

Determine the most appropriate locations for an initial deployment of smart mobility first mile/last mile (FMLM) technologies in the South Denver TMA
## Analysis Considerations

<table>
<thead>
<tr>
<th>Does</th>
<th>Does Not</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Provide an analysis of the existing built environment</td>
<td>• Consider planned or projected development and infrastructure to anticipate future conditions</td>
</tr>
<tr>
<td>• Identify the most appropriate stations for initial deployment of FMLM Smart Mobility Solutions</td>
<td>• Identify where FMLM are not appropriate or should not be implemented</td>
</tr>
<tr>
<td>• Provide planning-level assessment of FMLM Smart Mobility Solutions that could work</td>
<td>• Define detailed infrastructure investments or operational investments</td>
</tr>
</tbody>
</table>
Characteristics for Investment Areas

- Low-speed, narrow roadways
- Well-connected to other modes
- High demand (O-D Trips)
- High population and employment density
Step 1: Mobility Need
- RTD Ridership
- Distance to Station
- Land Use Mix
- Employment Density
- Population Density
- Modeshift Market (O-D)

Step 2: Infrastructure Readiness
- Roadway Width
- Intersection Density
- Parking at Stations
- Connectivity with other modes

Step 3: Technology Application

Automated Shuttle
- Roadways Size: 18.25
- Signalized intersections: 2.5
- Modeshift Market: 20
- Existing FlexRide Market/Link Market: 25
- Total Score: 65.75

MicroTransit
- Roadways Size: 18.3
- Signalized intersections: 2.5
- Modeshift Market: 20.0
- Existing FlexRide Market/Link Market: 25.0
- Total Score: 81.0

Micromobility
- Roadways Size: 11.0
- Signalized intersections: 13.5
- Modeshift Market: 16.0
- Bicycle Infrastructure: 17.5
- Total Score: 58.0

MoD
- Connectivity to Other Modes: 12.0
- Signalized intersections: 1.0
- Modeshift Market: 24.0
- Existing FlexRide Market/Link Market: 20.0
- Intersection Density: 6.1
- Total Score: 63.1
Step 1 Analysis

RTD Ridership +
Distance to Station +
Land Use Mix +
Employment Density +
Population Density +
Modeshift Market (O-D)
• Study area encompasses **45-minute transit catchment**

• 2019 weekday morning commute (6-10AM)

• 608 census block groups

• Population and O-D Trace data in ArcGIS attribute tables
Step 1 Analysis

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population Density</td>
<td>15%</td>
</tr>
<tr>
<td>Employment Density</td>
<td>25%</td>
</tr>
<tr>
<td>Land Use</td>
<td>10%</td>
</tr>
<tr>
<td>Distance From Transit</td>
<td>10%</td>
</tr>
<tr>
<td>Ridership</td>
<td>15%</td>
</tr>
<tr>
<td>Modeshift Market (O-D)</td>
<td>25%</td>
</tr>
</tbody>
</table>

Step 1 Analysis

- Belleview: 67
- Orchard: 51
- Arapahoe: 68
- DryCreek: 56
- CountyLine: 46
- Lincoln: 50
- SkyRidge: 27
Step 2 Analysis

Roadway Width
+ Intersection Density
+ Parking at Stations
+ Connectivity with other modes
Step 2 Analysis

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roadway Width</td>
<td>25%</td>
</tr>
<tr>
<td>Intersection Density</td>
<td>25%</td>
</tr>
<tr>
<td>Parking Space Availability</td>
<td>15%</td>
</tr>
<tr>
<td>Connectivity with Other Modes</td>
<td>35%</td>
</tr>
</tbody>
</table>

Score

- 35
- 37
- 47
- 53
- 64
- 66
- 64

- Belleview
- Orchard
- Arapahoe
- Dry Creek
- County Line
- Lincoln
- Sky Ridge

Step 2 Analysis
Step 3 Analysis

- Automated Shuttles
- Mobility on Demand
- Micromobility
- Microtransit
- Mobility as a Service
Step 3 Analysis: FlexRide Market

Technologies

- Automated Shuttle
- Mobility on Demand
- Microtransit
- Mobility as a Service

Number of Trips by Station

<table>
<thead>
<tr>
<th>Station</th>
<th>Trips</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bellevue</td>
<td>6,044</td>
</tr>
<tr>
<td>Orchard</td>
<td>7,567</td>
</tr>
<tr>
<td>Arapahoe</td>
<td>3,948</td>
</tr>
<tr>
<td>Dry Creek</td>
<td>24,869</td>
</tr>
<tr>
<td>County Line</td>
<td>8,118</td>
</tr>
<tr>
<td>Lincoln</td>
<td>13,498</td>
</tr>
<tr>
<td>Sky Ridge</td>
<td>0</td>
</tr>
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</table>
Autonomous Shuttles

General Information
• Micro-transit operations for first/last mile journeys
• Low-capacity vehicles that have the capability to operate at SAE Level 4 automation
• Currently used for routes under 2-miles, at a speed of under 20 mph, and with the capacity to transport 12 passengers
• Shuttle providers includes EasyMile, Navya, Local Motors, and May Mobility

Requirements
• Low speed roadways (<30mph) and requires wireless communications
• Intersection operations may require infrastructure such as connected technology
Step 3: Automated Shuttles

Criteria | Weight
---|---
Roadway Width | 25%
Signalized Intersections | 25%
Modeshift Market | 25%
Existing FlexRide Market | 25%

Average of Step 1, Step 2, and Step 3
Mobility on Demand (MoD)

General Information

- MoD has been explored to provide first/last mile trips, paratransit service, supplement transit, and connect transit deserts
- Riders can request a transportation mode to complete an end-to-end journey
- Could be implemented as a private-public partnership with a provider, such as a TNC, or by a public agency

Requirements

- Can be flexible with operating environment
- Requires a platform for booking and data
Step 3: Mobility on Demand

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intersection Density</td>
<td>10%</td>
</tr>
<tr>
<td>Modeshift Market</td>
<td>50%</td>
</tr>
<tr>
<td>Existing FlexRide Market</td>
<td>40%</td>
</tr>
</tbody>
</table>

Average of Step 1, Step 2, and Step 3
Micromobility

General Information
• Micromobility devices can serve first/last mile or point to point trips
• Shared, small mobility devices, such as bicycles and scooters
• May be docked or dockless
• Programs can be privately of publically operated
• Micromobility can fill in gaps in the transit system in terms of service span

Requirements
• Adequate bicycle and pedestrian infrastructure
• Narrower, low-speed roadways that are low-stress for bicyclists and people riding scooters
Step 3: Micromobility

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Weight</th>
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</thead>
<tbody>
<tr>
<td>Roadway Width</td>
<td>15%</td>
</tr>
<tr>
<td>Intersection Density</td>
<td>15%</td>
</tr>
<tr>
<td>Modeshift Market</td>
<td>20%</td>
</tr>
<tr>
<td>Bicycle Infrastructure</td>
<td>50%</td>
</tr>
</tbody>
</table>

Micromobility Scores:

- Bellevue: 91
- Orchard: 68
- Arapahoe: 87
- Dry Creek: 52
- County Line: 40
- Lincoln: 62
- Sky Ridge: 58

Micromobility Composite Score:

- Bellevue: 76
- Orchard: 59
- Arapahoe: 72
- Dry Creek: 55
- County Line: 42
- Lincoln: 51
- Sky Ridge: 46

Average of Step 1, Step 2, and Step 3
Microtransit

General Information

• Microtransit can be used to provide service between zones, for point-to-point trips within a defined service zone, and for connectivity to and from fixed-route service
• Shared transportation system that can offer fixed routes and schedules as well as flexible routes and on-demand scheduling
• Provide trips to populations who cannot access transit due to lack of service of mobility

Requirements

• Can be flexible with operating environment
Step 3: Microtransit

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roadway Width</td>
<td>30%</td>
</tr>
<tr>
<td>Signalized Intersections</td>
<td>10%</td>
</tr>
<tr>
<td>Modeshift Market</td>
<td>30%</td>
</tr>
<tr>
<td>Existing FlexRide Market</td>
<td>30%</td>
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</tbody>
</table>

Average of Step 1, Step 2, and Step 3

Microtransit Scores

<table>
<thead>
<tr>
<th>Station</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bellevue</td>
<td>72</td>
</tr>
<tr>
<td>Orchard</td>
<td>66</td>
</tr>
<tr>
<td>Arapahoe</td>
<td>56</td>
</tr>
<tr>
<td>Dry Creek</td>
<td>74</td>
</tr>
<tr>
<td>County Line</td>
<td>55</td>
</tr>
<tr>
<td>Lincoln</td>
<td>60</td>
</tr>
<tr>
<td>Sky Ridge</td>
<td>29</td>
</tr>
</tbody>
</table>

Microtransit Composite Score

<table>
<thead>
<tr>
<th>Station</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bellevue</td>
<td>69</td>
</tr>
<tr>
<td>Orchard</td>
<td>59</td>
</tr>
<tr>
<td>Arapahoe</td>
<td>62</td>
</tr>
<tr>
<td>Dry Creek</td>
<td>63</td>
</tr>
<tr>
<td>County Line</td>
<td>47</td>
</tr>
<tr>
<td>Lincoln</td>
<td>51</td>
</tr>
<tr>
<td>Sky Ridge</td>
<td>36</td>
</tr>
</tbody>
</table>
Mobility as a Service

General Information
• Mobility as a Service can be used for point-to-point trips and first/last mile trips
• Allows customers to access a variety of rides or vehicles where and when they need it

Requirements
• Can be flexible with operating environment
Step 3: Mobility as a Service

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connectivity to Other Modes</td>
<td>30%</td>
</tr>
<tr>
<td>Modeshift Market</td>
<td>30%</td>
</tr>
<tr>
<td>Existing FlexRide Market</td>
<td>20%</td>
</tr>
<tr>
<td>Intersection Density</td>
<td>20%</td>
</tr>
</tbody>
</table>

Average of Step 1, Step 2, and Step 3

Mobility as a Service Score

- Score: [Graph showing scores for different locations]

Mobility as a Service Composite Score

- Score: [Graph showing composite scores for different locations]
Conclusion
Composite Score Summary

Average of Step 1, Step 2, and Step 3

MOBILITY EVOLUTION INITIATIVE

25
AvCo Golden

**Shuttles** | 16 total

**Sites** | Three distinct cities
- Golden
- Greenwood Village
- Colorado Springs

**Use Cases** | Different audiences, riders
- College campus and small town circulator
- First/Last Mile commuter connection w/train
- Urban downtown circulator

**Duration** | 18+ months, staggered deployment

**Length** | 1.8 - 3.7 miles

**Service** | Free, 5-15 minute frequency
AvCo Vision

Golden
In Service

Greenwood Village

Colorado Springs
Denver South – Working Towards Implementation

• Micromobility
  • Developing deployment strategy for DTC

• Mobility-on-Demand
  • RTD FlexRide/Metro Taxi Pilot

• Microtransit
  • Lone Tree Link Expansion

• Mobility as a Service
  • FTA AIM Grant
  • Partnership with RTD, CDOT (Bustang), Lone Tree Link
THANK YOU
QUESTIONS?
Examples of Census Block Analysis

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Weight</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population Density</td>
<td>15%</td>
<td>8</td>
</tr>
<tr>
<td>Employment Density</td>
<td>25%</td>
<td>70</td>
</tr>
<tr>
<td>Land Use</td>
<td>10%</td>
<td>100</td>
</tr>
<tr>
<td>Distance From Transit</td>
<td>10%</td>
<td>100</td>
</tr>
<tr>
<td>Ridership</td>
<td>15%</td>
<td>80</td>
</tr>
<tr>
<td>Modeshift Market (O-D)</td>
<td>25%</td>
<td>99</td>
</tr>
<tr>
<td>Weighted Score</td>
<td></td>
<td>76</td>
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</table>