Bus Rapid Transit Peer Review

TriMet Powell-Division BRT Planning

April 2, 2015

Overview- Why are we here?

1. Review the elements of Bus Rapid Transit (BRT)
2. Understand BRT design flexibility and options
3. Review peer agency BRT services
4. Learn lessons from peer agencies

What is BRT?

A flexible, high performing rapid transit mode that combines a variety of physical, operating, and system elements with a quality image and unique identity

The Results?

FASTER SERVICE

INCREASE RELIABILITY

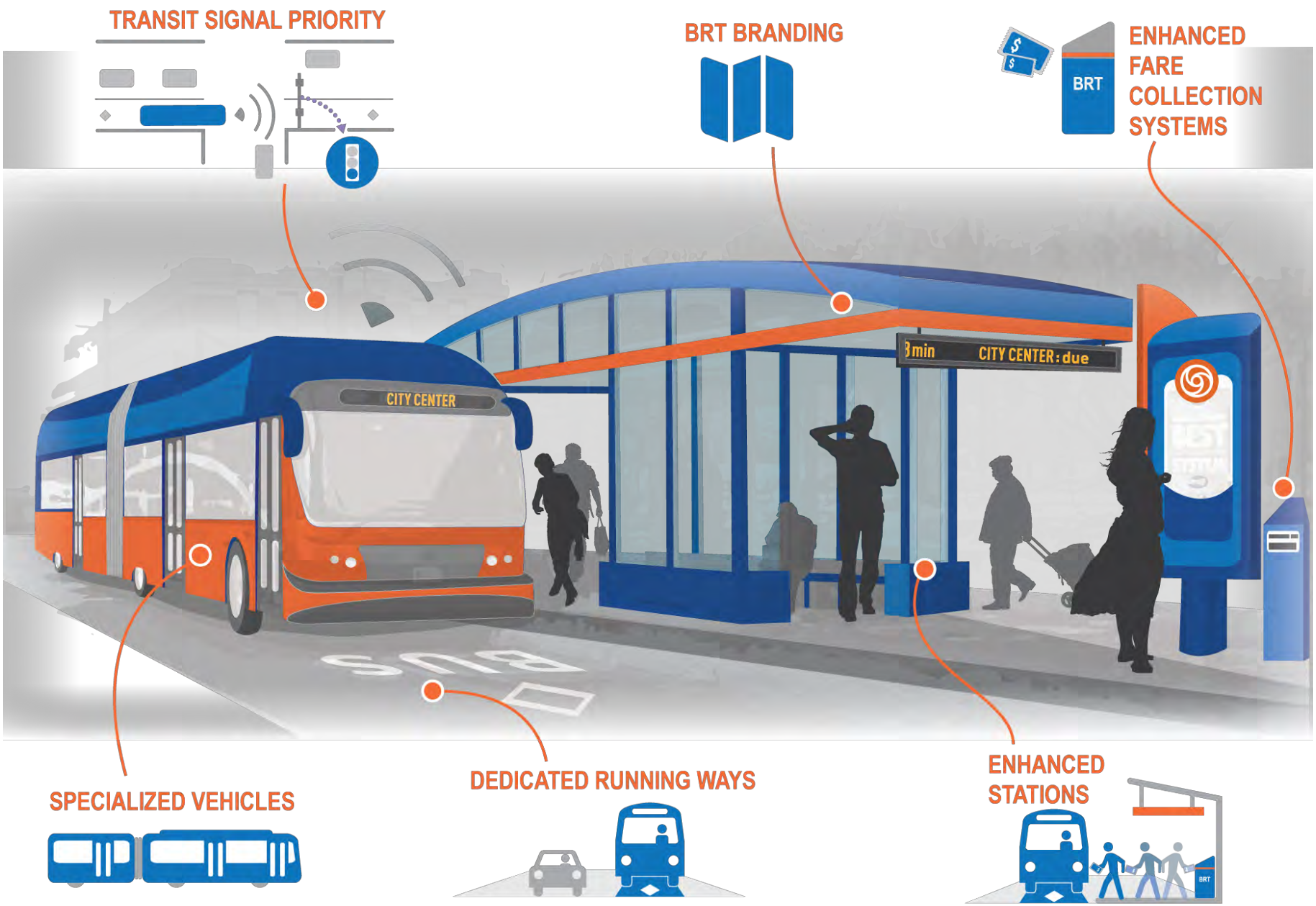
IMPROVE PASSENGER EXPERIENCE

ATTRACT NEW RIDERS

ECONOMIC DEVELOPMENT

The Elements of BRT

- Transit Way
- Stop Spacing
- Vehicles
- Stations and Terminals
- Traffic Signal Priority
- Image/Branding
- Service Plan and Design


TRANSIT SIGNAL PRIORITY
BRT BRANDING
BRT
ENHANCED FARE COLLECTION SYSTEMS
CITY CENTER
3 min
CITY CENTER : due
BUS
SPECIALIZED VEHICLES
DEDICATED RUNNING WAYS
ENHANCED STATIONS
BRT

Transit Way

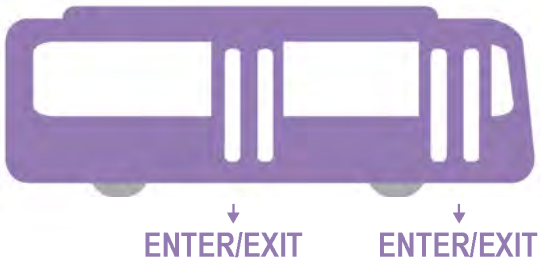
- Fully exclusive, shared, or hybrid
- Treatments can be protime or permanent

SHARED HYBRID EXCLUSIVE

Vehicle Options

- Rail Styled
- 2 or 3 Door Boarding; Doors on Both Sides
- Enhanced Wheelchair Boarding
- Bikes on Board

Vehicle Options



Standard Length Buses (40’)

Front or all/door Boarding

Left and/or right door boarding

Longer Buses (60’)

All-Door Boarding

Left and/or right door boarding

Stations

Stations

East 9th Street
East 9th Street
Huntington Bank
623-1500
4 RIDERS · 1 FARE

Stations

BRT STATION

RAIL STYLE

Enhanced Reliability Treatments

- Business Access Transit Lanes
- Peak Period Only Bus Lanes
- A Few Blocks to Many Miles

Transit Signal Priority

- Range of signal uses that reduce bus delay
- Often tied to lane treatments
- Conditional & unconditional

Share traffic signals
Bus subject to congestion

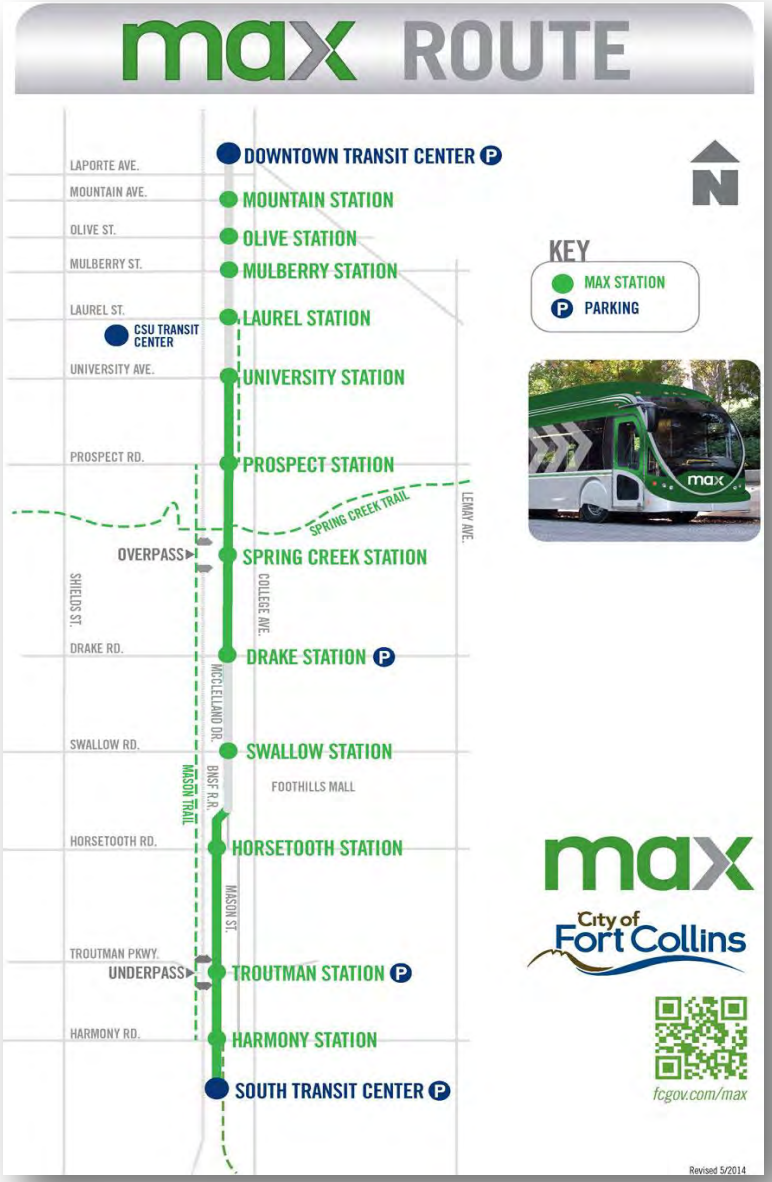
Transit signals
Traffic bypass lane

Branding

- Unique brand and features
- Integrated design elements

BRT Service Design

- Direct
- Reliable
- Connected
- Anchored



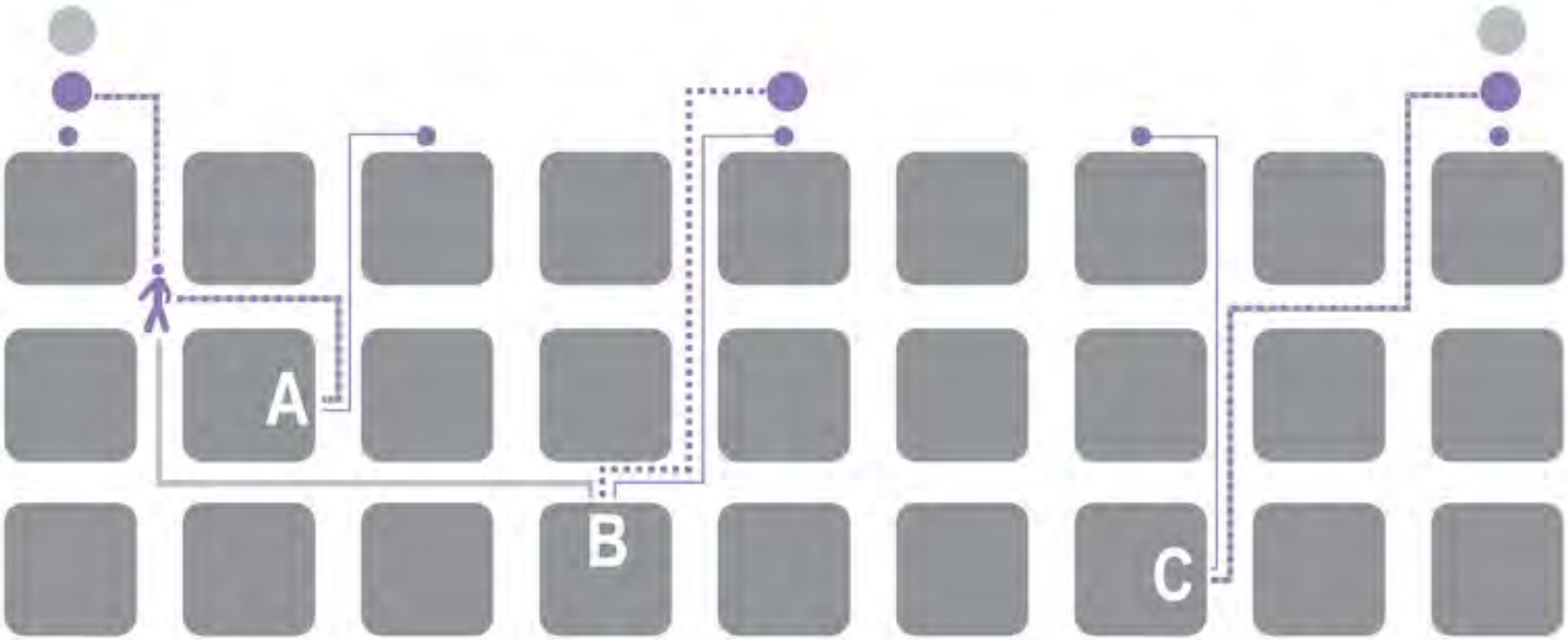
BRT Markets Served

PRIMARY BRT MARKET	COMMON TRIP TYPES	TYPICAL SERVICE DESIGN
Regional	▪ Long distance commutes ▪ Trips between cities	▪ BRT – wide spacing (up to 1 mile) ▪ Service underlay where local access needed
Hybrid	↕	↕
Urban	▪ Local commutes ▪ Shopping & services ▪ Recreation	▪ BRT – closer s pacing (1/3 – 1/2 mile) ▪ No service underlay

Stop Spacing

- Land use
- Intersection Spacing
- Transit Connections
- Flexible

Stop Spacing



BlocksTraveled by Service Provided

	1/8 mi. Service	BRT 1/4 mi.	BRT 1/2 mi.
Household A	2 blocks	3 blocks	3 blocks
Household B	3 blocks	3 blocks	5 blocks
Household C	3 blocks	3 blocks	4 blocks

Walking Travel Path to Transit Stop

- BRT Stop (1/2 mile stop spacing) and Path
- BRT Stop (1/4 mile stop spacing) and Path
- 1/8 mi. Service Stop and Path

Underlay Service

- High cost to run BRT and underlay in same corridor
- Typical with over ½ mile stop spacing
- No underlay = feeder service enhancement opportunity

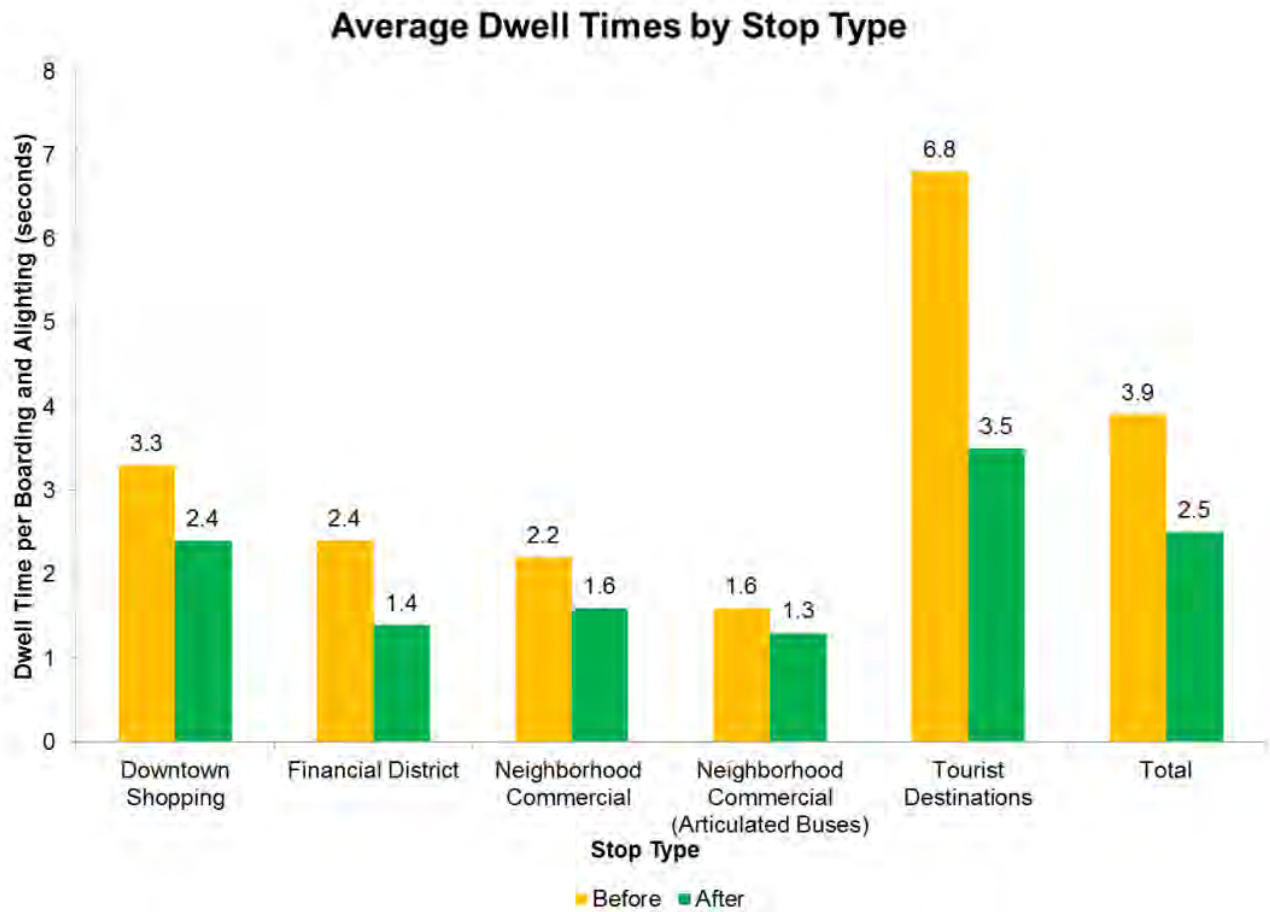
Dwell Times

- All door boarding
- Level platform boarding
- Efficient wheelchair loading

Dwell Times

- All door boarding
- Efficient wheelchair loading

In San Francisco, all-door boarding has saved **1 to 3 seconds per passenger**



Bike Carrying and Access

- Front loading often disallowed due to dwell time impacts
- Some systems allow bikes on board

Peer Review

Five peer agencies operating BRT were selected

Agency	Location	Name
Community Transit	Snohomish County, WA	SWIFT
KCATA	Kansas City, MO	MAX
King County Metro	Seattle, WA	RapidRide
Metro Transit	Minneapolis, MN	Red Line
Sun Metro	El Paso, TX	Brio

Peer Review

What can other systems teach us about…?

- **Stop spacing**
- **Service design**
- **Underlay service**
- **Vehicles, stations, and branding**
- **Access for peds and bikes**
- **Results: Ridership and travel time changes**

Community Transit

Swift BRT *2009*

Snohomish County, WA

SWIFT at a glance:

- **17** miles long
- **7** miles have bus + right turn lane
- **1** mile *average* stop spacing
- **12** minute peak frequency; **20** minutes off-peak
- **60** foot vehicles, all-door boarding

Service Design

Community Transit

Swift BRT

Snohomish County, WA

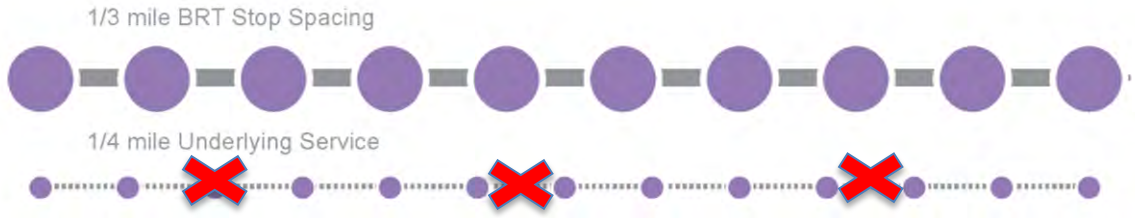
- **Travel times:** 25% reduction in end-to-end travel times
- **Travel Time:** TSP and lane treatments contribute; but intersection improvements more important than linear transit lanes
- **Reduced station dwell times** - 25% of original dwell time
- **Ridership:** Increased by 20% above previous corridor ridership in first 18 months (despite system decline)
- **On Board Bikes**: riders allowed to board if racks are full and space available
- **Design vision:** model to rail standards; flex where design feature has limited benefit

KCATA
MAX BRT *2005, 2010*
Kansas City, Missouri

MAX at a glance:

- **2 lines** Main St. (5.7 miles) and Troost Ave. (8.4 miles)
- **10** minute peak frequency; 15 minutes off-peak
- **21** hours of weekday service
- **40** foot vehicles, single-door boarding
- **Peak hour** bus lanes
- Focus on **far side stop** placement

Service Design



MAIN STREET MAX

Removed

KCATA

MAX BRT

Kansas City, Missouri

- **Travel time:** KCATA estimates 20% time savings
- **Travel Time:** TSP and lane treatments contribute; but intersection improvements more important than linear transit lanes
- **Ridership:** KCATA estimates 50%+ ridership in Main Street corridor and modest increases on Troost
- **Background Service:** Eliminated in Main Street Corridor
- **Service Plan:** MAX vehicles operate long-line service beyond BRT project

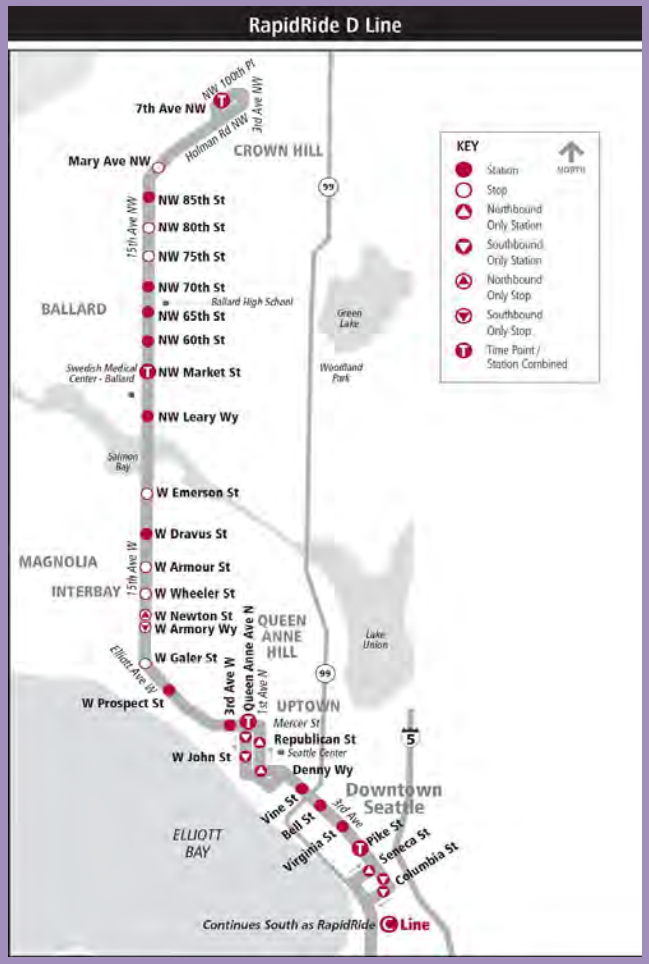
King County Metro

RapidRide BRT *2010 - 2014*

King County, WA

RapidRide at a glance:

- **6 lines** and **64** total miles
- **3 lines** are in the City of Seattle
- **1/2** mile <u>average</u> stop spacing
- **10** minute or better peak frequency; **15** minutes off-peak
- **24** hours of weekday service
- **60** foot vehicles, all-door boarding



Service Design

King County Metro

RapidRide BRT

King County, WA

- **Travel time:** C,D, and E lines show average 20% travel times improvement
- **Ridership:** most comparable lines carry 7,000 to 13,000 daily passengers
- **Ridership:** ridership increases on all lines, lowest: E Line, 12% and highest: A Line, 76%
- **Peak Express:** West Seattle and Ballard Urban Villages have KCM peak express service to downtown
- **Implementation:** many BRT features not in place at outset; led to negative customer response

Metro Transit

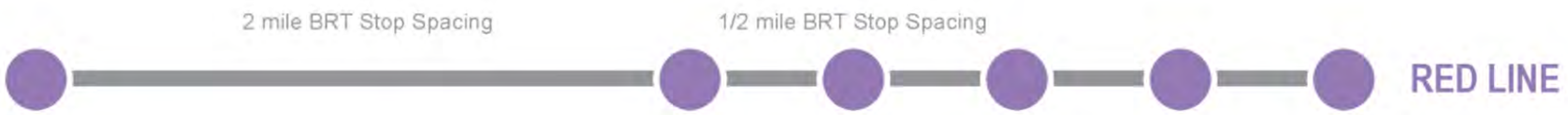
Red Line BRT *2014*

Great Minneapolis, MN

Red Line at a glance:

- **10** miles total length
- **15** minute headway, peak and off-peak
- **19.5** hours of weekday service
- Stations with **boarding gates**
- **40** foot vehicles, all-door boarding
- **Railhead**
- **Unique funding**

Service Design



Metro Transit

Red Line BRT

Great Minneapolis, MN

- **Travel times:** Metro Transit estimates limited time savings through BRT elements and route design
- **Ridership:** No previous service; Metro Transit is currently analyzing Red Line ridership
- **Facilities:** very high level of station and passenger facility investment
- **Branding**: branded to match light rail system

Sun Metro

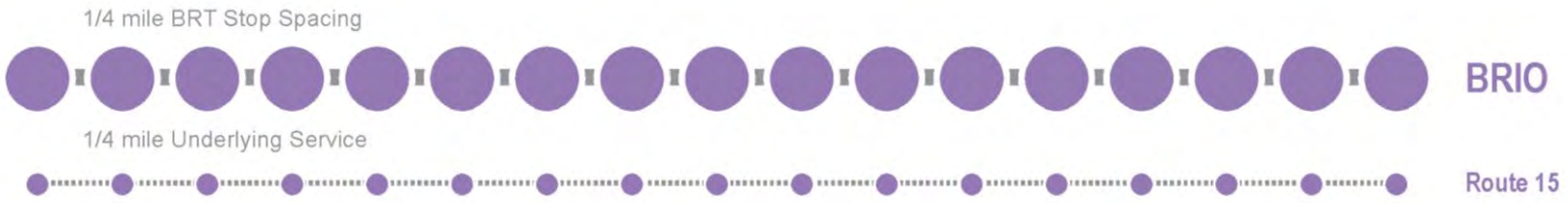
Brio BRT

El Paso, TX

Brio at a glance:

- **8.8** miles total length
- **1.5** miles of transit + right turn lane
- Close **stop spacing**
- **TSP** conditional (bus <100 ft of signal)
- **60** foot BRT vehicles with wifi
- **3** door boarding

Service Design



Sun Metro

Brio BRT

El Paso, TX

- **Travel times:** 20 minute cycle time savings
- Brio **ridership** ~2,500 rides/weekday
- **Underlay service** lost 50% ridership (down ~1,500 rides/day);

Peer Lessons

- **Ridership:** All systems experience impressive increases in corridor ridership
- **Markets**: Systems report little anecdotal evidence that existing riders are lost; wider stop spacing embraced post implementation
- **Underlay service:** Few systems have underlay service in urban land use context
- **Travel time:** Linear lane treatments may not provide high value for cost; intersection treatments do
- **Travel time:** each boarding counts

Peer Lessons

- **Vehicles:** 40’ vehicles often provide sufficient capacity at high frequency; 60’ BRT vehicles more attractive and provide more flexibility
- **Stations**: opportunity for creative transit architecture, shelters vary by climate and street conditions, full-features and comfort can mitigate longer walk access
- **Access**: opportunity to enhanced pedestrian and ADA conditions
- **Branding**: consistent, iconic, local
- **Planning:** Develop a design vision and stick to it

Questions?