Third Avenue Skip-Stop Operations

Now a Rainbow of Frequent, Efficient Service

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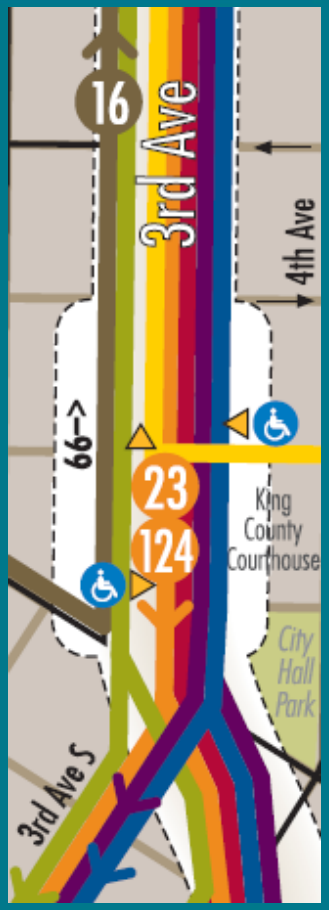


2011 Multimodal Operations Planning Workshop

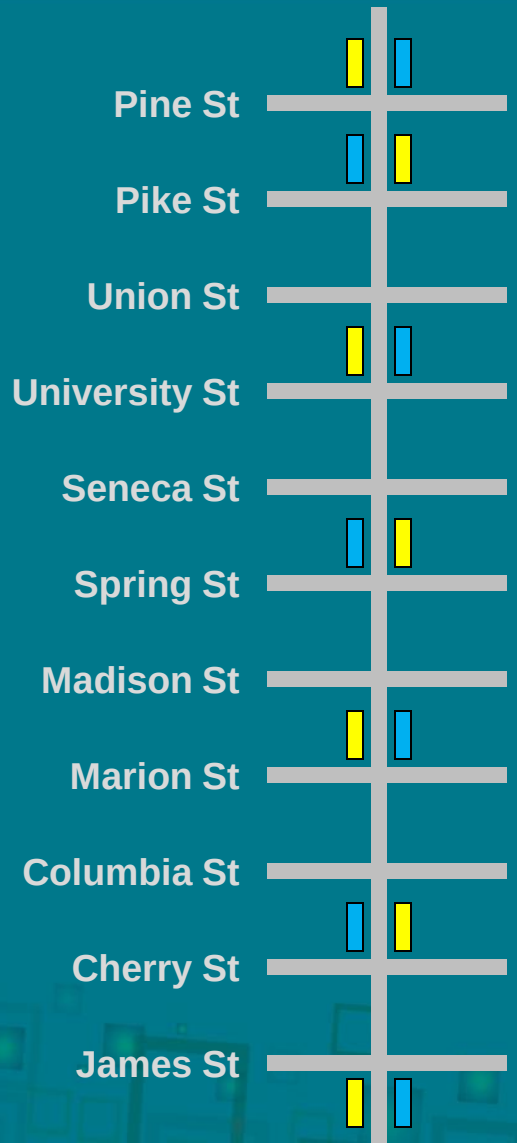
Background

Transit through Downtown Seattle

- North-South Orientation
- 5 Surface Avenues
- Bus/LRT Tunnel
- 5,300 Daily Trips
- 3rd Avenue "Transit Spine"
  - 60,000 riders/weekday

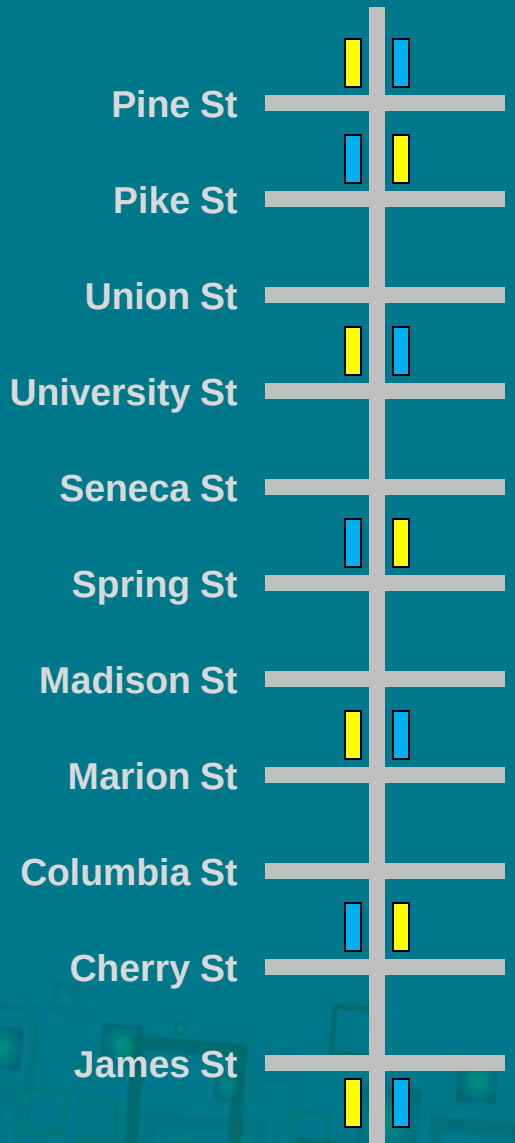
3rd Avenue Transit Spine
Recent History

- 2005: 2-year Bus Tunnel Closure
  - Traffic restrictions
  - Blue/Yellow Skip-Stops
- 2007: Tunnel reopening
  - Keep transit priority features
  - Capacity evaluation



3rd Avenue Transit Spine
February 2011 Service Change

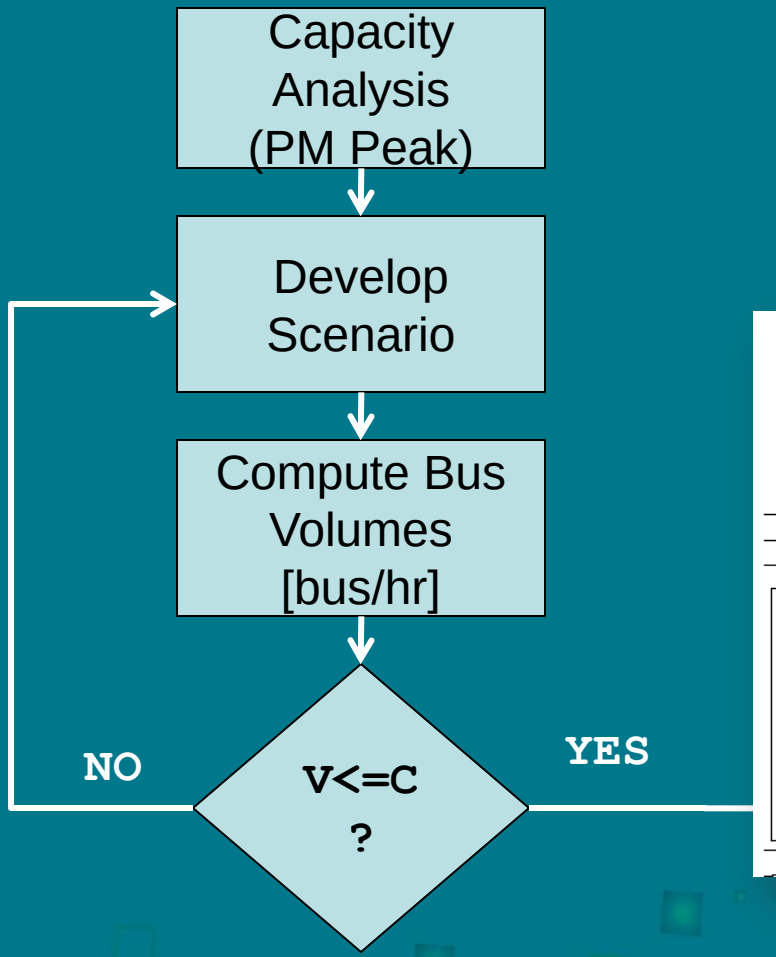
- 1st Ave Construction
  - Long term
  - Intermittent closures
  - Need to move service
- Questions:
  - Can 3rd Ave take the 1st Ave routes?
  - Which routes to assign to which skip-stops?

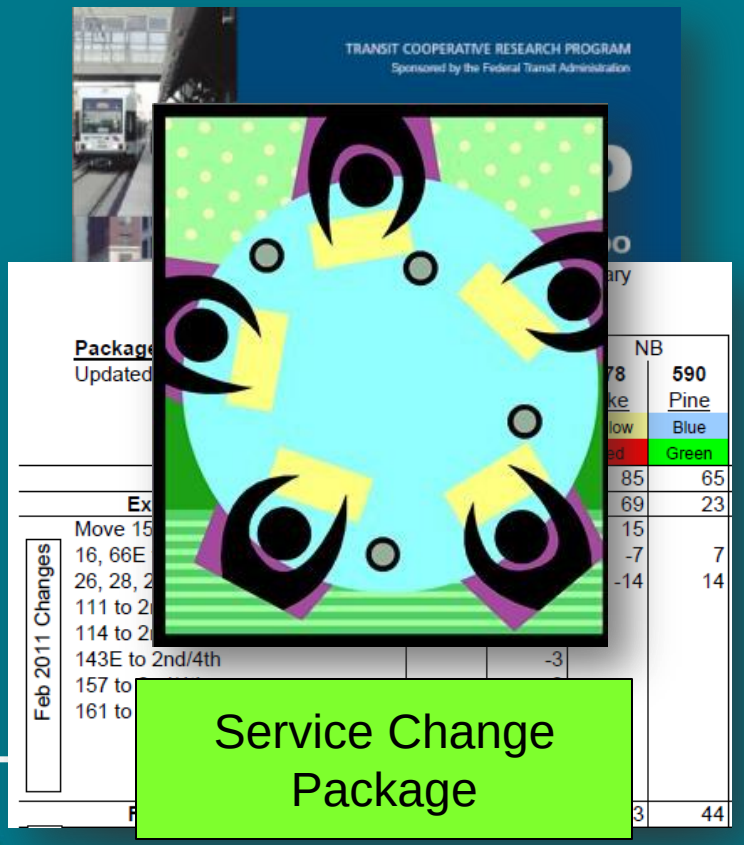


3rd Avenue Transit Spine
February 2011 Service Change

- Goals:
  - Move 1st Ave routes
  - Prepare *Rapid Ride* routes
  - Minimize changes
- Constraints:
  - Rapid Ride stations on same block both directions
  - Common stop routes
  - Trolley wire

Methodology
General Approach



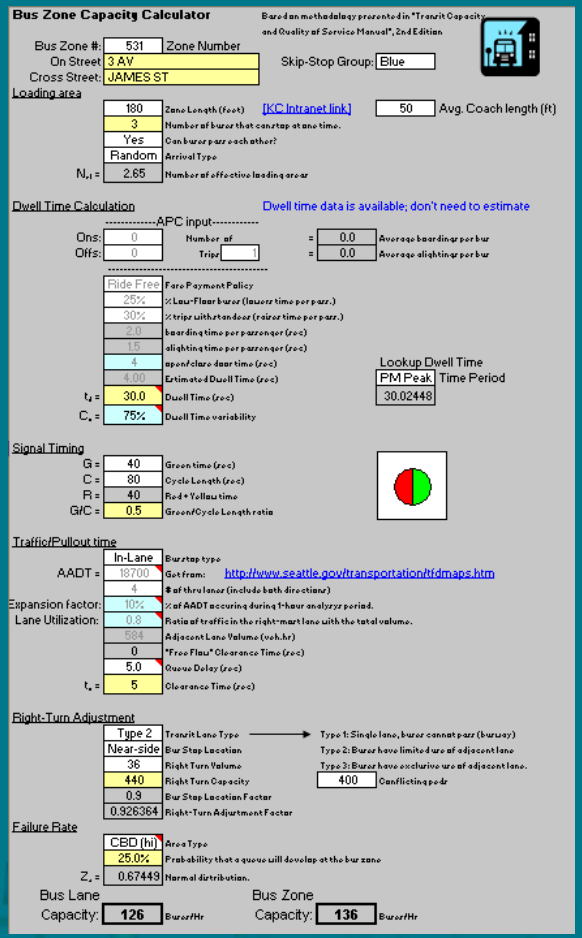


Methodology
Bus Stop Capacity

Main Inputs

- # of Loading Areas
- Dwell Time
- Signal Timing
- Clearance Time
- Right-Turn Traffic
- Failure Rate

Calculation Worksheet



Bus Zone Capacity Calculator

Based on methodology presented in "Transit Capacity and Quality of Service Manual", 2nd Edition

Bus Zone #: 531 Zone Number
On Street: 3 AV
Cross Street: JAMES ST
Skip-Stop Group: Blue

Loading area
180 Zone Length (feet) [KC Intranet link] 50 Avg. Coach length (ft)
3 Number of buses that can stop at one time.
Yes Can buses pass each other?
Random Arrival Type
N_{la} = 2.65 Number of effective loading areas

Dwell Time Calculation — Dwell time data is available; don't need to estimate

APC input
Ons: 0 Number of = 0.0 Average boardings per bus
Offs: 0 Trips 1 = 0.0 Average alightings per bus

Fare Payment Policy
25% % Low-Floor buses (lower time per pass.)
30% % trips with front door (raiser time per pass.)
2.0 boarding time per passenger (sec)
1.5 alighting time per passenger (sec)
4 open/close door time (sec)
4.00 Estimated Dwell Time (sec)
t_d = 30.0 Dwell Time (sec)
C_v = 75% Dwell Time variability

Lookup Dwell Time
PM Peak Time Period
30.02448

Signal Timing
G = 40 Green time (sec)
C = 80 Cycle Length (sec)
R = 40 Red + Yellow time
G/C = 0.5 Green/Cycle Length ratio

Traffic/Pullout time
In-Lane Bus stop type
AADT = 18700 Get from: http://www.seattle.gov/transportation/ttdmaps.htm
4 # of thru lanes (include both directions)
Expansion factor: 10% % of AADT occuring during 1-hour analysis period.
Lane Utilization: 0.8 Ratio of traffic in the right-most lane with the total volume.
584 Adjacent Lane Volume (veh/hr)
0 "Free Flow" Clearance Time (sec)
5.0 Queue Delay (sec)
t_c = 5 Clearance Time (sec)

Right-Turn Adjustment
Type 2 Transit Lane Type → Type 1: Single lane, buses cannot pass (bus only)
Near-side Bus Stop Location — Type 2: Buses have limited use of adjacent lane
36 Right Turn Volume — Type 3: Buses have exclusive use of adjacent lane.
440 Right Turn Capacity 400 Conflicting peds
0.9 Bus Stop Location Factor
0.926364 Right-Turn Adjustment Factor

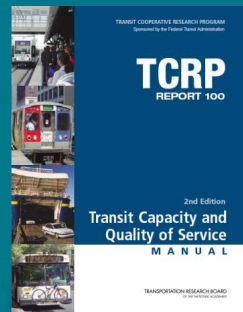
Failure Rate
CBD (hi) Area Type
25.0% Probability that a queue will develop at the bus zone
Z_v = 0.67449 Normal distribution.

Bus Lane Capacity: 126 Buses/Hr
Bus Zone Capacity: 136 Buses/Hr

Output

Bus Stop Capacity

[bus/hr]



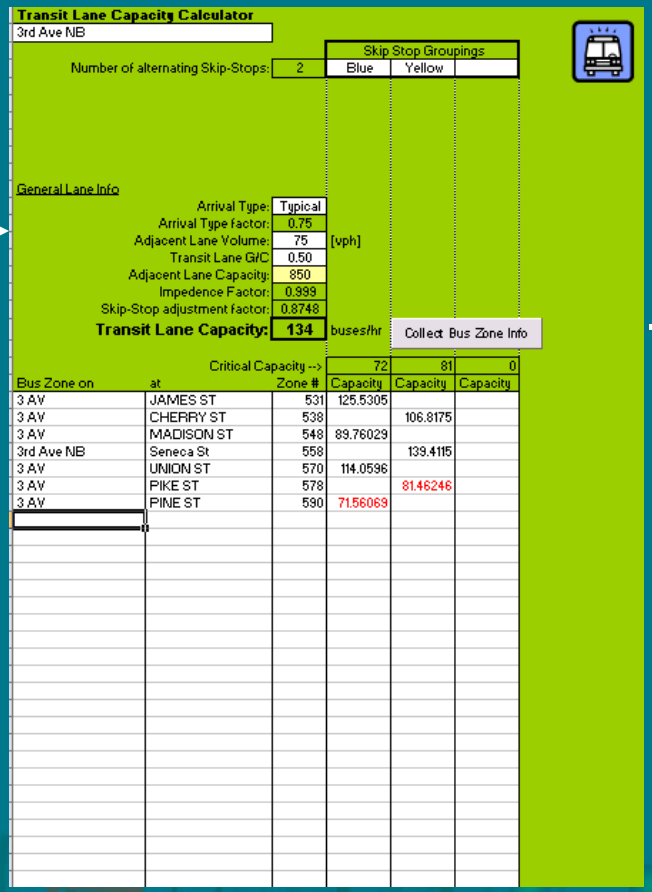
Methodology
Corridor Capacity

Main Inputs | Calculation Worksheet | Output

Adjacent Lane traffic

Blue Zone Capacity

Yellow Zone Capacity



Transit Lane Capacity Calculator

3rd Ave NB

Number of alternating Skip-Stops: 2

Skip Stop Groupings: Blue | Yellow

General Lane Info

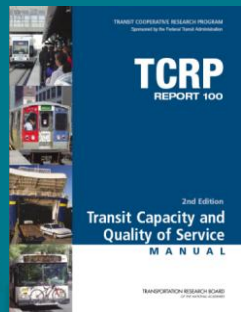
Arrival Type:	Typical
Arrival Type factor:	0.75
Adjacent Lane Volume:	75 [vph]
Transit Lane G/C:	0.50
Adjacent Lane Capacity:	850
Impedence Factor:	0.999
Skip-Stop adjustment factor:	0.8748
Transit Lane Capacity:	**134** buses/hr

Collect Bus Zone Info

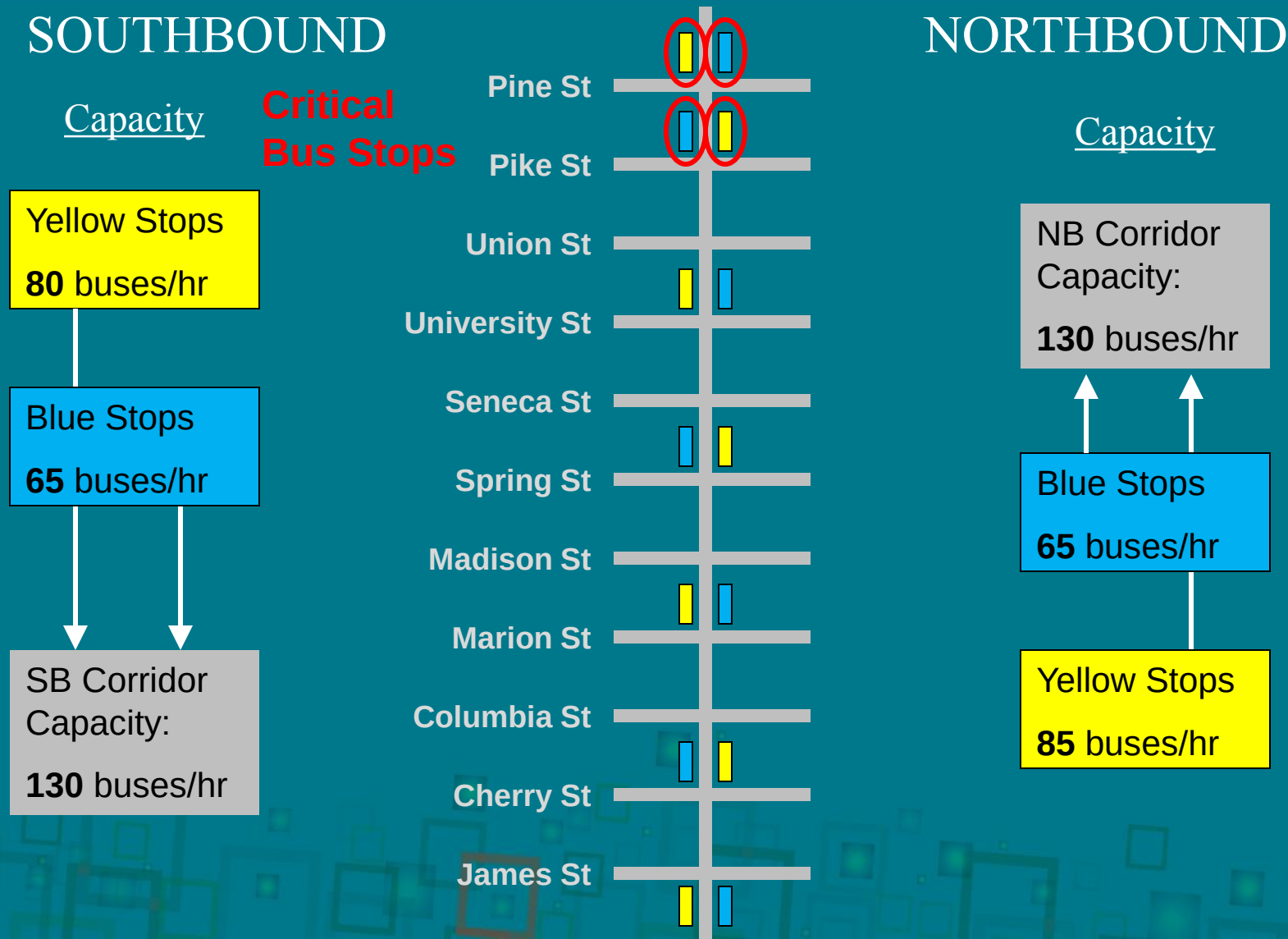
			Critical Capacity -->	72	81	0
Bus Zone on	at	Zone #	Capacity	Capacity	Capacity
3 AV	JAMES ST	531	125.5305		
3 AV	CHERRY ST	538		106.8175	
3 AV	MADISON ST	548	89.76029		
3rd Ave NB	Seneca St	558		139.4115	
3 AV	UNION ST	570	114.0596		
3 AV	PIKE ST	578		81.46246	
3 AV	PINE ST	590	71.56069		

Corridor Capacity

[buses/hr]



Methodology
Capacity Analysis Results



Scenarios
First Attempts

- Bus Stops Overloaded
  - Blue SB
  - Yellow NB
- Possible Solutions
  - Move routes to 2nd/4th Ave
  - Split common routes
  - Different color per direction
  - Something else?

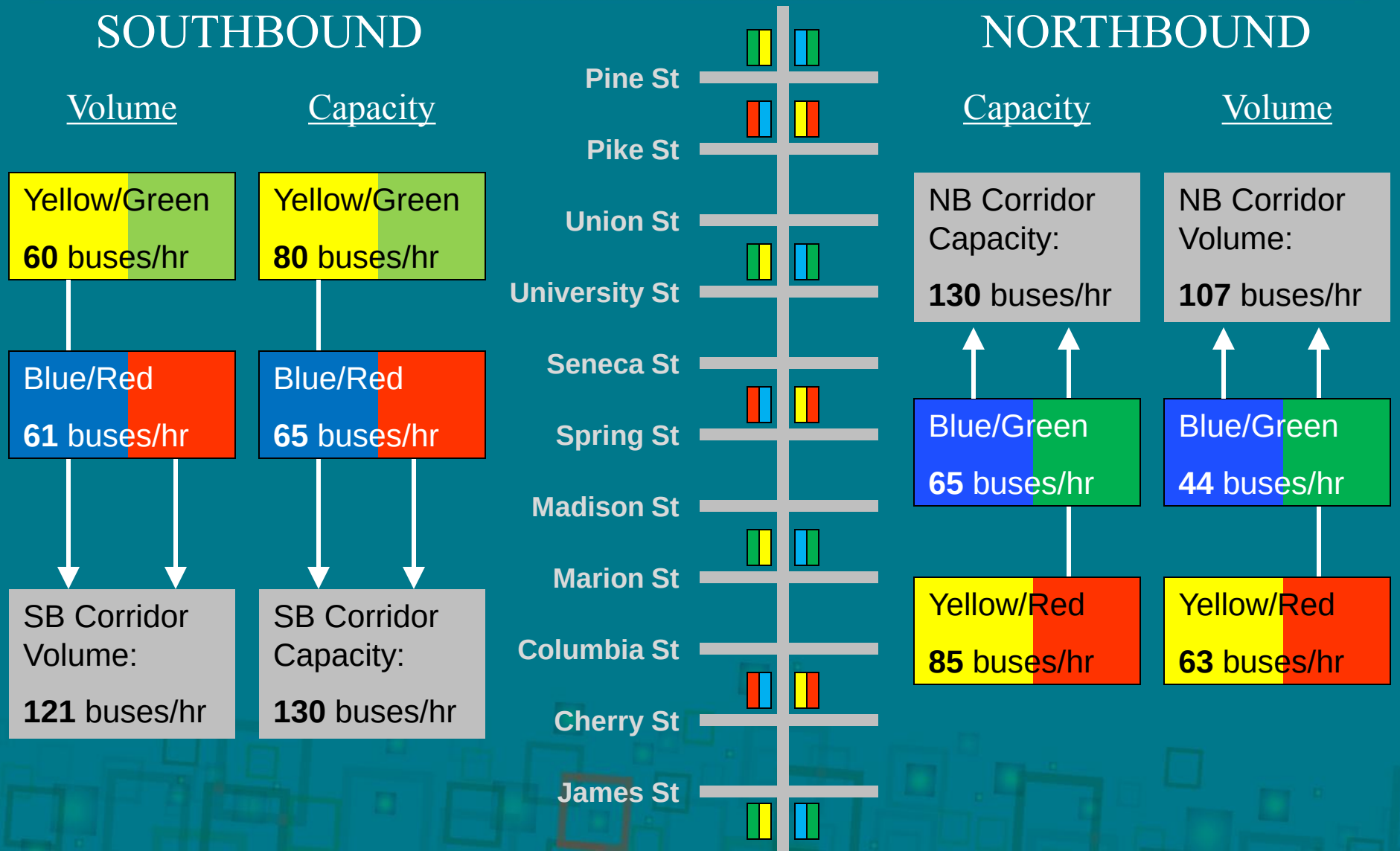
Scenarios
A New Approach

- New Skip-Stop Colors
  - Red: Rapid Ride & related Routes
  - Green: Routes adjusting to make room for Red routes
- Each Route Assigned One Color
- Refine Scenarios

Scenarios
Refinement

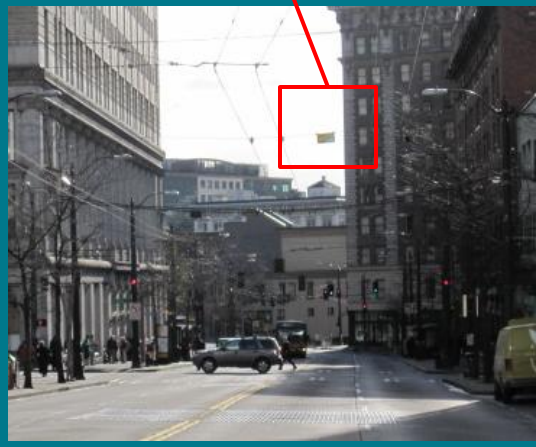
- Move some routes to 2nd/4th Ave
  - Suburban peak-only routes
  - Available capacity
- Consider future changes
  - 2012: Rapid Ride C & D
  - Avoid making customers switch twice
- Tunnel Closed Scenario

Scenarios
February 2011 Final



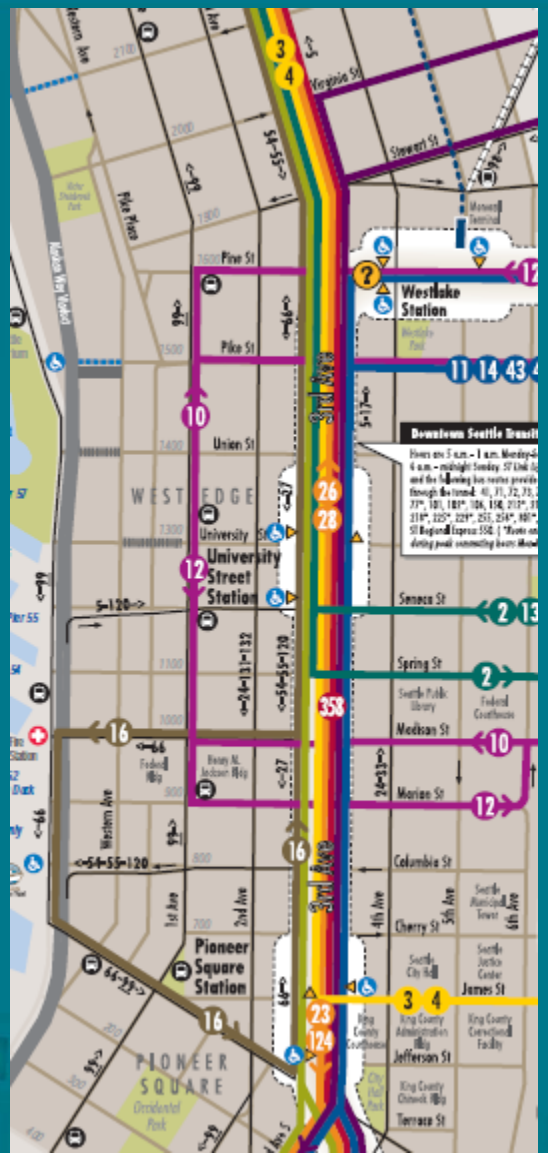
Implementation

- New Color Markers
  - At bus stop sign
  - Overhead advance markers
- Operator Training
- *Street Teaming*



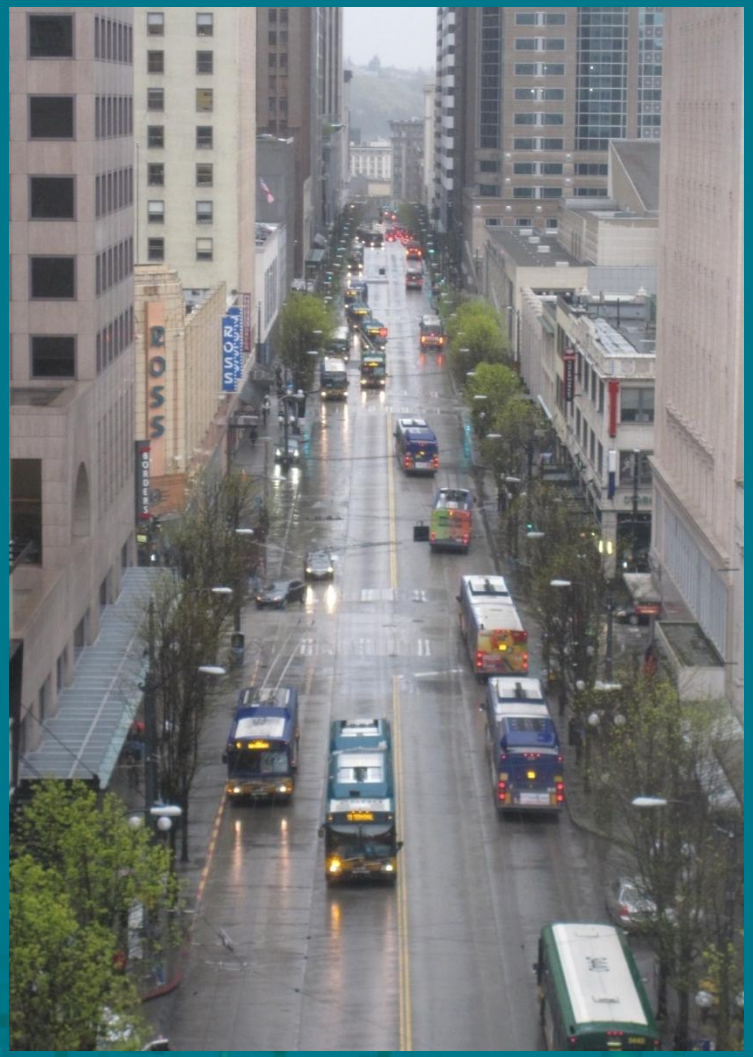
Results
Customer's Perspective

- Frequent Service
- Common Stops Improved!
- Maximizing use of Transit Priority Street
- Color System Tool for Identifying Skip Stops



Results
Your Perspective

- See for yourself!
- 3rd Avenue Tour
  - Meet at Westlake Station after the Tunnel Tour
    - Estimated Departure 2:30PM
  - Visit critical bus stops



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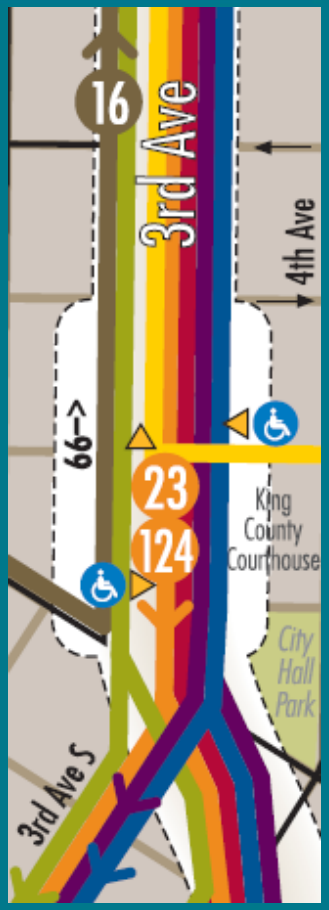

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