



BICYCLE NETWORK DESIGN

- To prevent crashes
- To increase ridership
- To facilitate livability

2018
ASSESSMENT OF BICYCLING IN BEND

CURRENT PRACTICE: ONE SIZE FITS ALL BIKE LANES



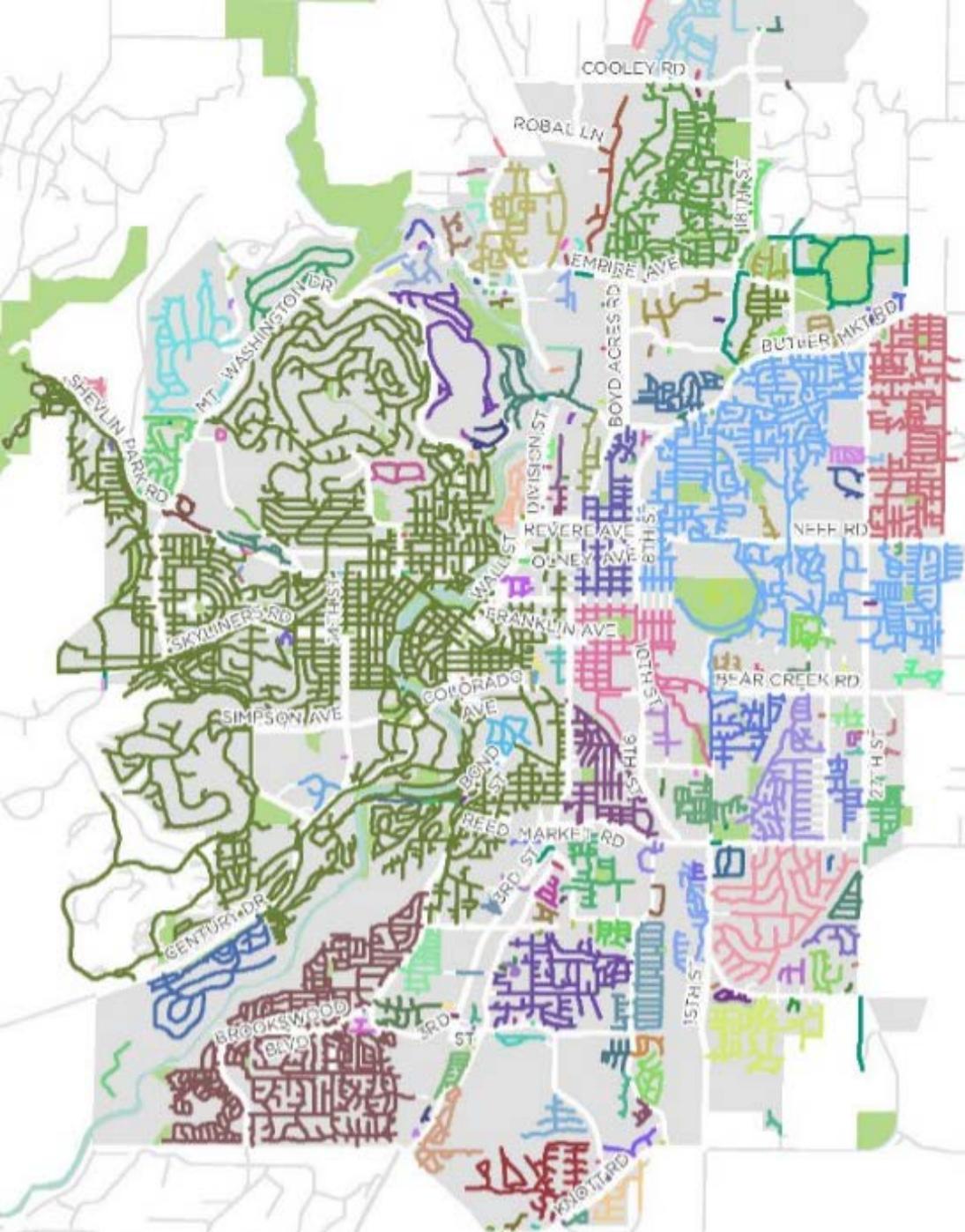
2018 BASELINE (EXISTING CONDITIONS)



Bike Facility Type	Low-Stress	High-Stress
Basic bike lane	23% 26 miles	77% 89 miles
Buffered, Protected or Path	21 miles	

GAPS, DISCONTINUITY





QUANTIFIED LOW TRAFFIC STRESS



What we found:

- Low Stress Islands
- Separated by high stress or missing bike facilities

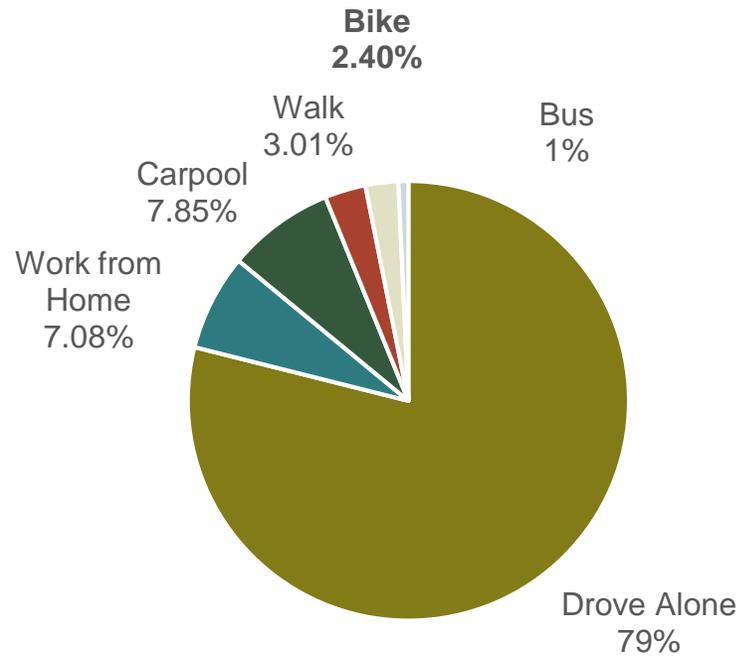


- Someone walking or biking represented 30% of all fatal and serious injury crashes
- Behavior? Yes, but system design, too:
 - ✓ Crossing a 4 or 5 lane road
 - ✓ Riding the wrong way (safe crossings are too far apart)
 - ✓ The HOOK (intersection conflicts between bicyclist & cars)

BIKE TO WORK TRIPS

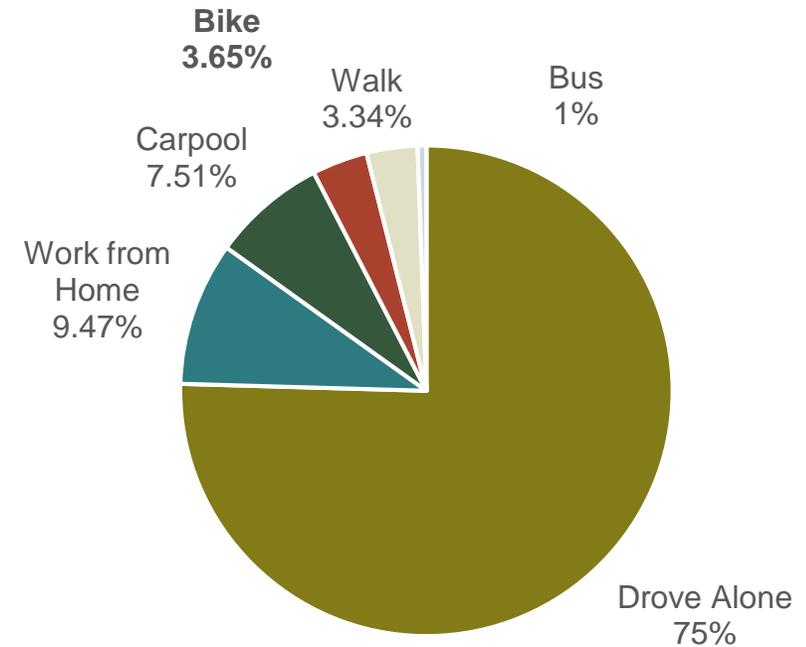


Bike to Work is under 4% but it is increasing



2009 Census, Bend, Oregon

■ Drove Alone ■ Work from Home ■ Carpool ■ Walk ■ Bike ■ Bus



2016 Census, Bend, Oregon

■ Drove Alone ■ Work from Home ■ Carpool ■ Bike ■ Walk ■ Bus

CURRENT BEST PRACTICES

INNOVATIONS: ON THE SHOULDERS OF GIANTS



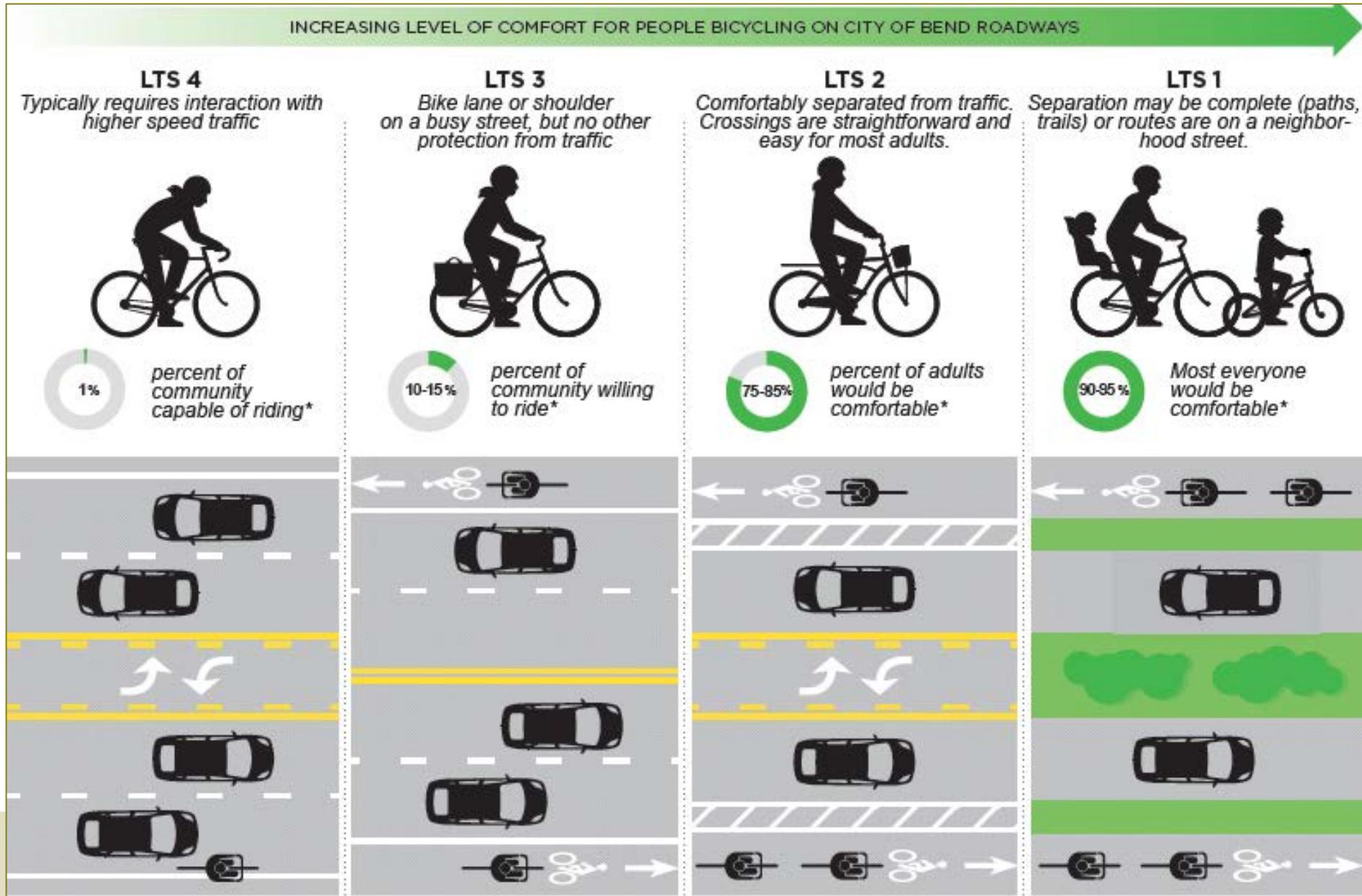


July 2018 ODOT adopted the **Level of Traffic Stress Analysis** as best practice methodology for developing bikeways





LEVEL OF TRAFFIC STRESS



EVERYONE IS DIFFERENT – BUT WE CAN GENERALIZE

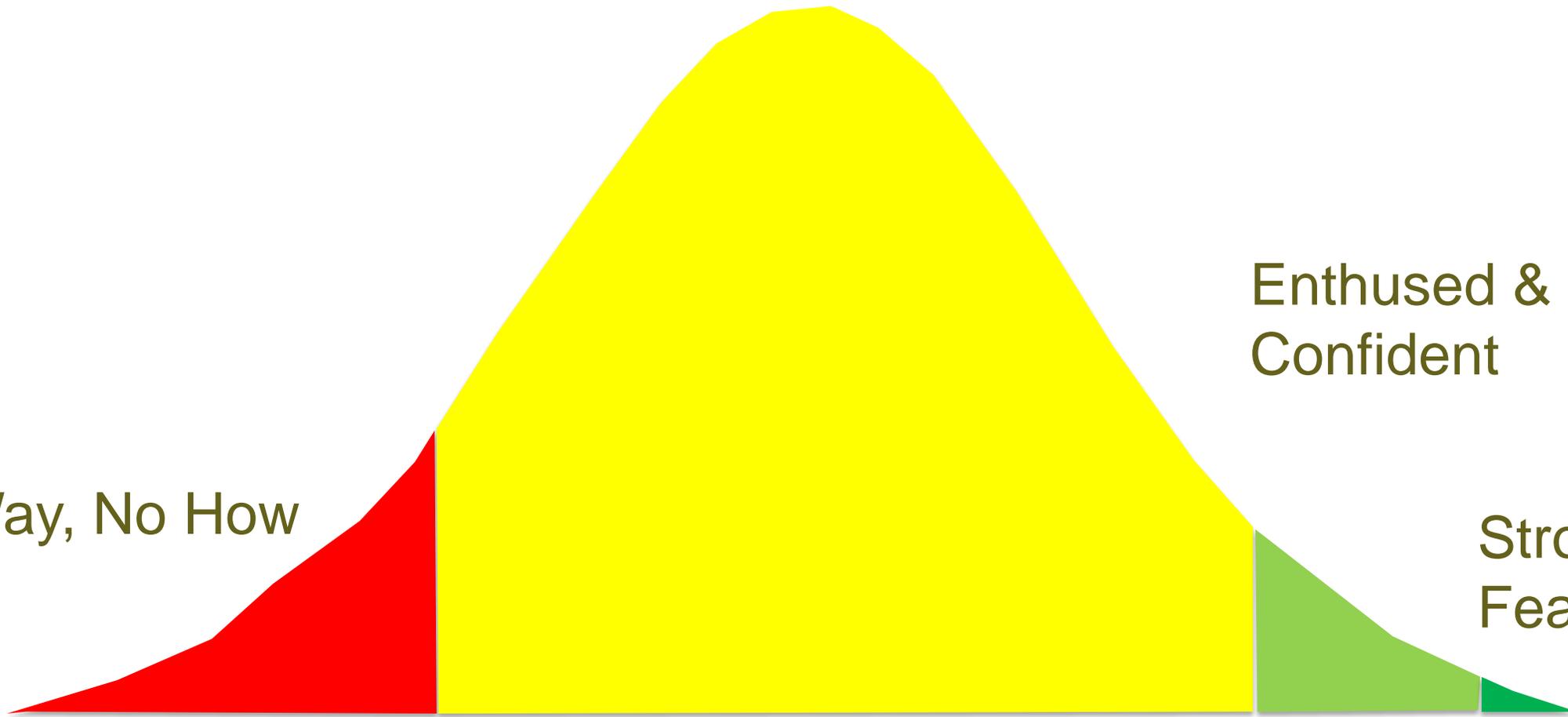


Interested but Concerned

No Way, No How

Enthused &
Confident

Strong &
Fearless



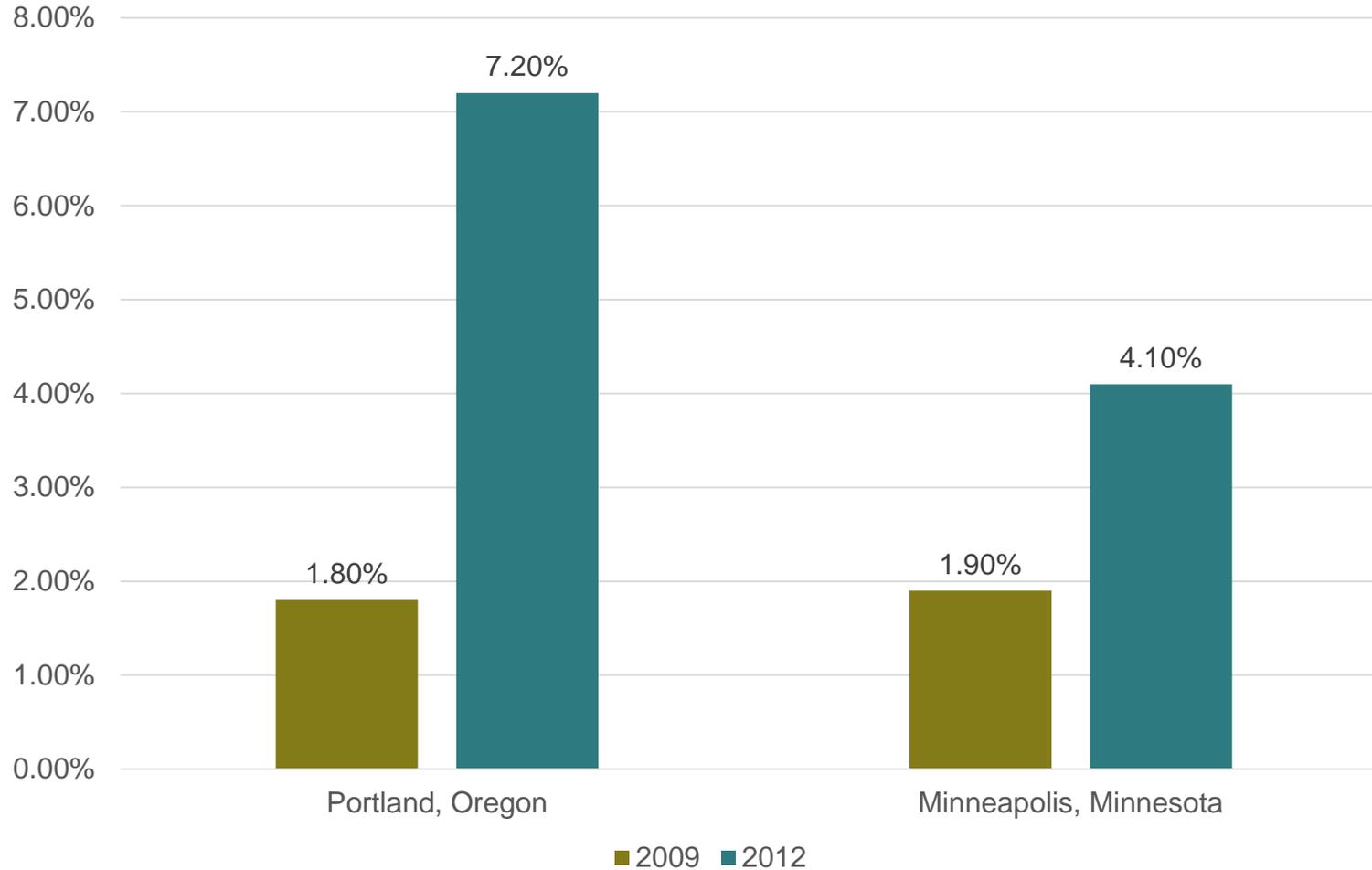
RIDER TYPES

¹ Roger Geller, City of Portland Bureau of Transportation. Four Types of Cyclists. <http://www.portlandonline.com/transportation/index.cfm?&a=237507>. 2009.

² Dill, J., McNeil, N. Four Types of Cyclists? Testing a Typology to Better Understand Bicycling Behavior and Potential. 2012.



Bike to Work Mode Share



Also:

- Davis, California 18.6%
- Corvallis, Oregon 11.2%



INTEGRATING BEST PRACTICES IN BEND

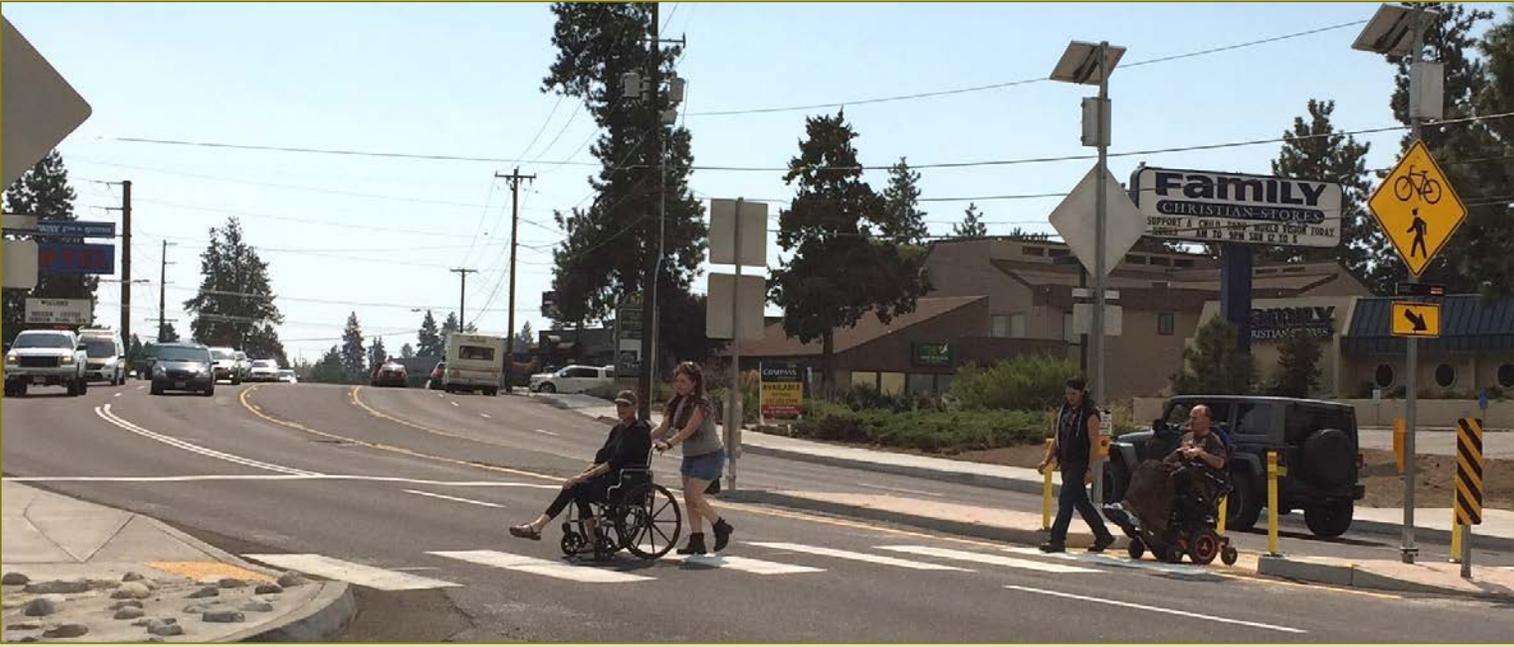
INGREDIENTS – MILES OF URBAN TRAILS



INGREDIENTS – INDIVIDUAL LOW STRESS SEGMENTS



INGREDIENTS – CROSSING BUSY STREETS



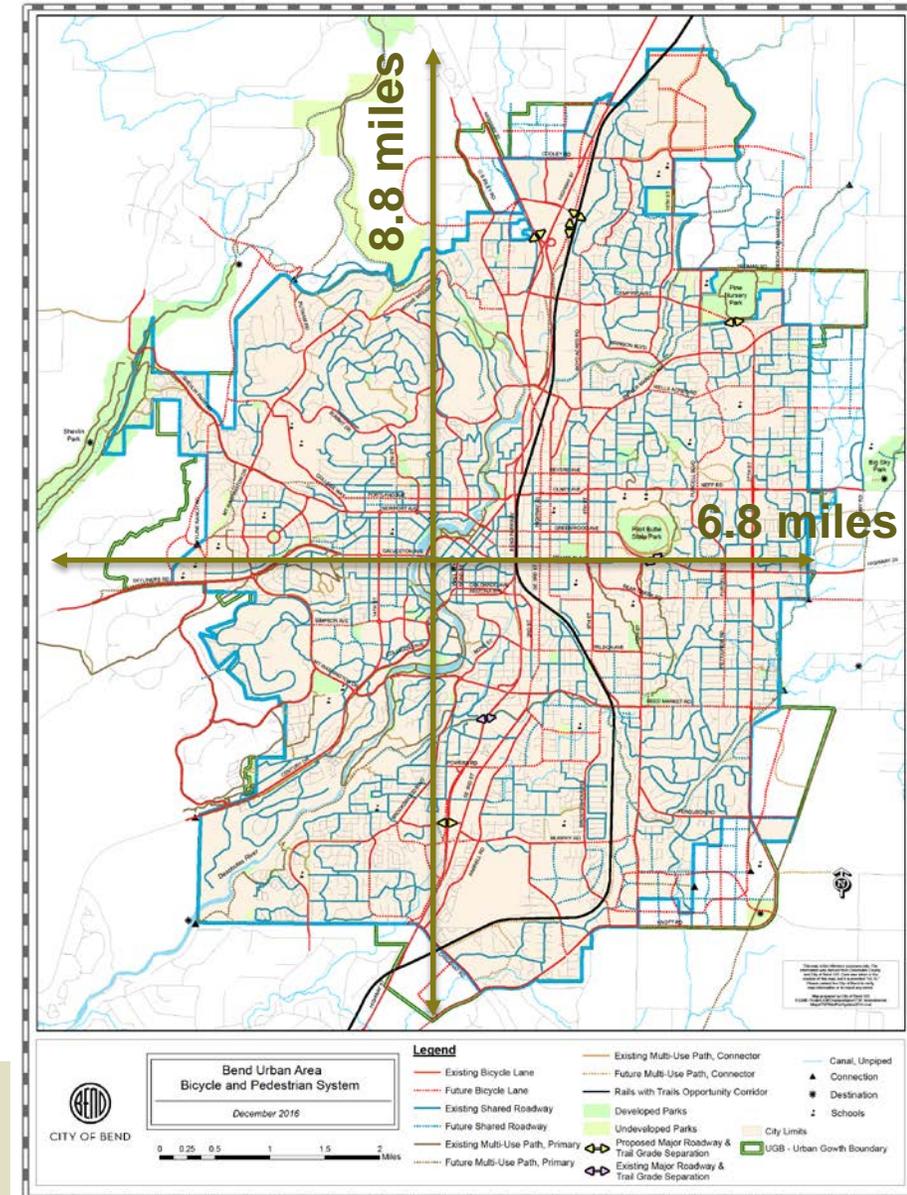
INGREDIENTS – NEIGHBORHOOD TRAFFIC CALMING



INGREDIENTS – REACHABLE DISTANCES



- All trips within Bend are short
- Even neighborhoods furthest from core travel less than 9.6 miles/day overall
- 9 miles north to south
- 7 miles east to west



A PROPOSAL FOR BEND'S LOW STRESS NETWORK

PARTNERSHIPS FOR BEND'S LOW STRESS NETWORK



Neighborhood
Associations

City Council

Planning
Commission

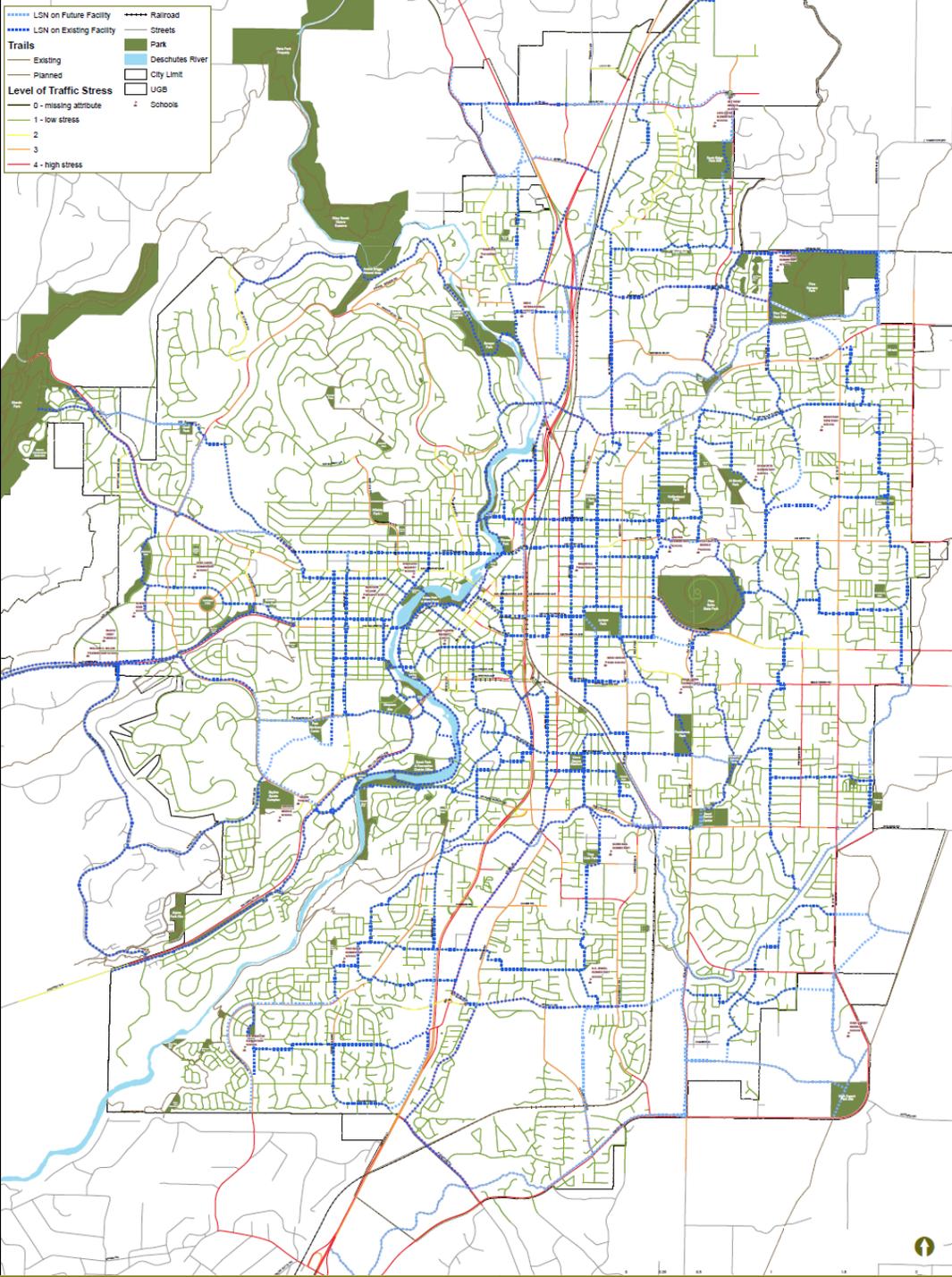
Traffic Safety
Advisory Committee



SET THE BAR AT LOW-STRESS



- Routes
- Intersections
- Anyone can use
- Use low cost, highly effective designs proven to increase safety and ridership



USE A NETWORK APPROACH



- Trails
- Paths
- Neighborhood greenways
- Critical arterial and collector roadways

DETAILED STEP BY STEP PROCESS - ATTRIBUTES



LEVEL OF TRAFFIC STRESS – QUANTIFIED

- FIELD WORK & GIS GEO-DATABASE
- Every block of the street system
- Speed, Bike Facility Type & Width
- Every intersection approach (signal, RAB, # lanes, Left and Right turn treatment)

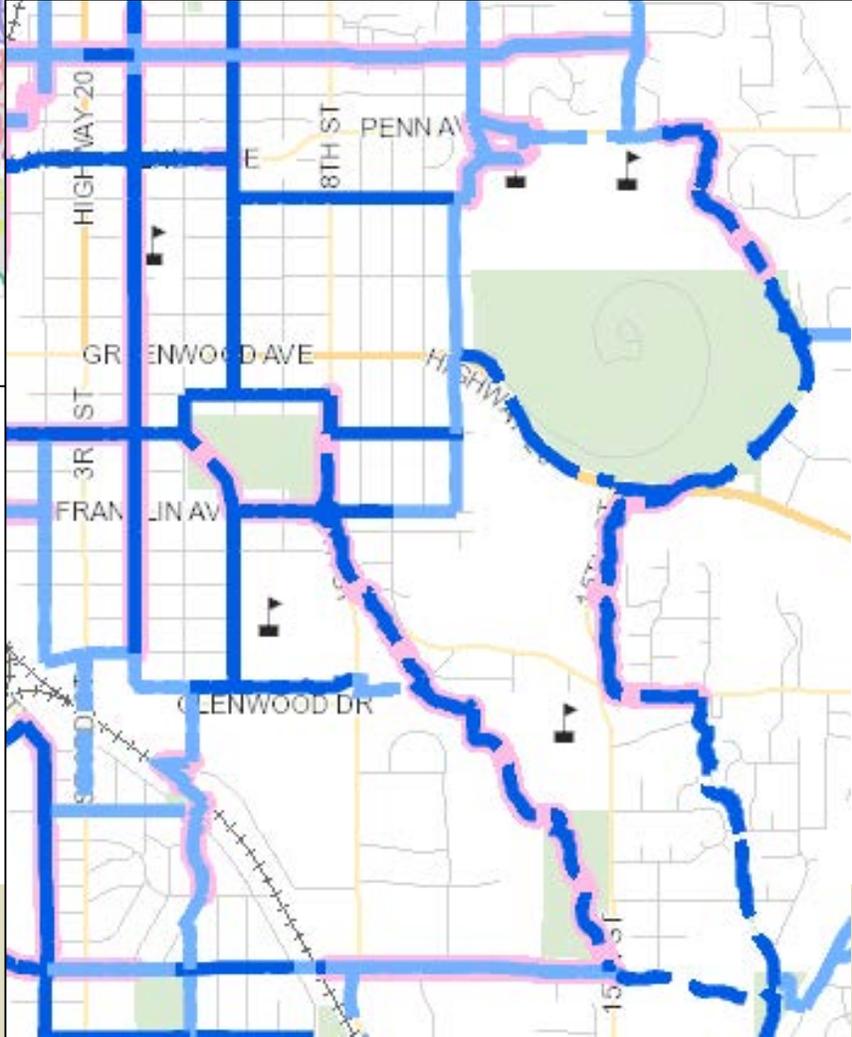
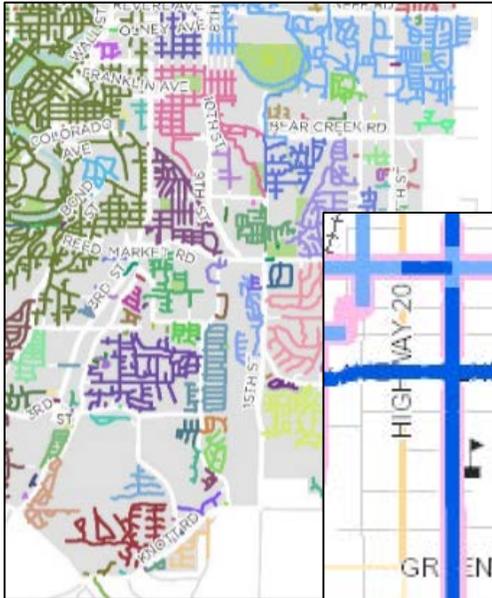
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Num_Lanes	<input type="text" value="2"/>	Speed2	<input type="text" value="25"/>
Park_Side	<input type="text"/>	Table_14_3	<input type="text"/>
Left_Turn	<input type="text" value="No turn lane"/>	Table14_4	<input type="text" value="1"/>
Right_Turn	<input type="text" value="No turn lane"/>	Table_14_5	<input type="text"/>
Median	<input type="text" value="No center median"/>	Segment_LTS	<input type="text" value="1"/>
Notes	<input type="text"/>	Table14_9	<input type="text" value="1"/>
Edit_Date	<input type="text" value="Apr 10, 2017 7:59 AM"/>	Table14_10	<input type="text"/>
Parking	<input type="text" value="No on-street parking"/>	Intersection_LTS	<input type="text" value="1"/>
Bike_Facility	<input type="text" value="Striped Bike Lane"/>	Table14_7	<input type="text"/>
		Roundabout	<input type="text"/>
		LTS	<input type="text" value="1"/>

DETAILED STEP BY STEP PROCESS – GAP CLOSURE



FOCUS AREAS IDENTIFIED

- Connectivity
- Existing Low Stress to serve schools, services, trails and how to get to them
- Existing barriers and isolated islands

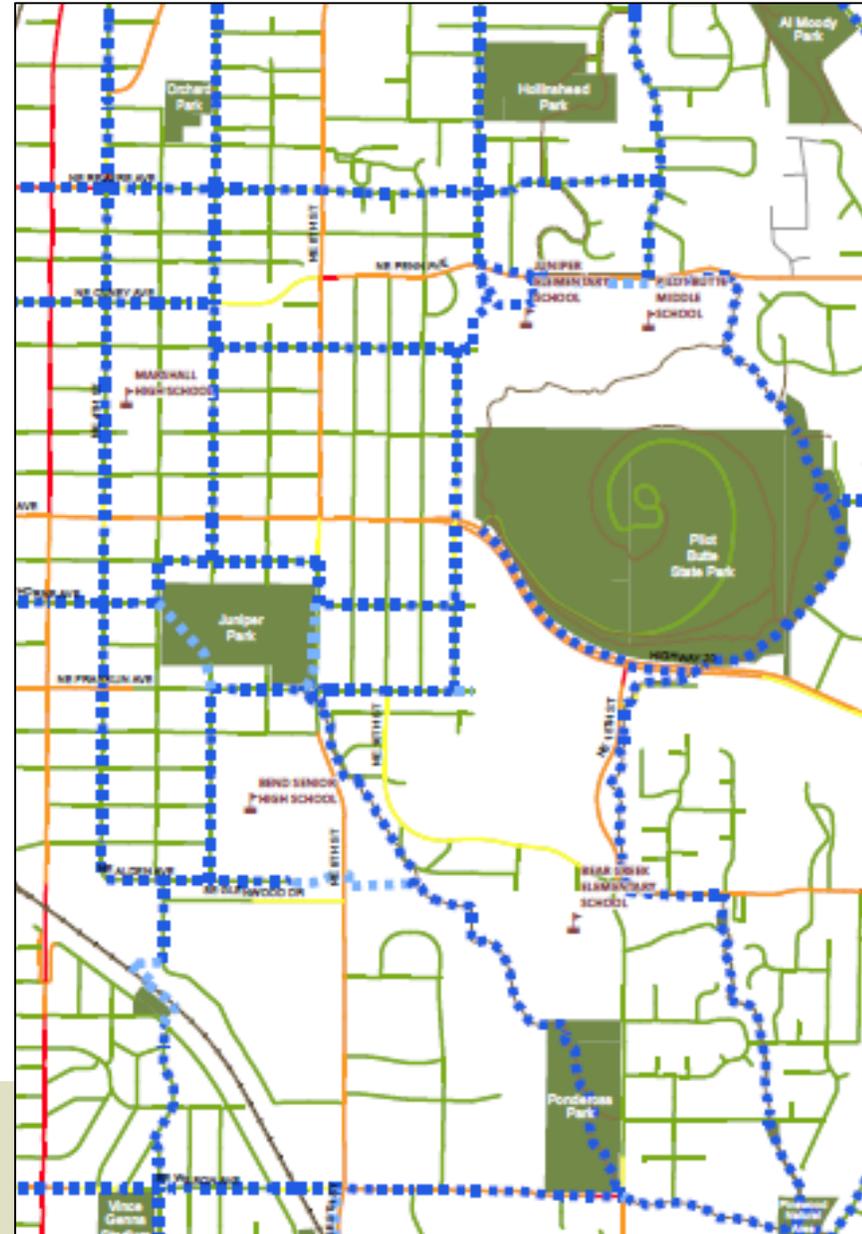


DETAILED STEP BY STEP PROCESS – ROUTE CANDIDATES

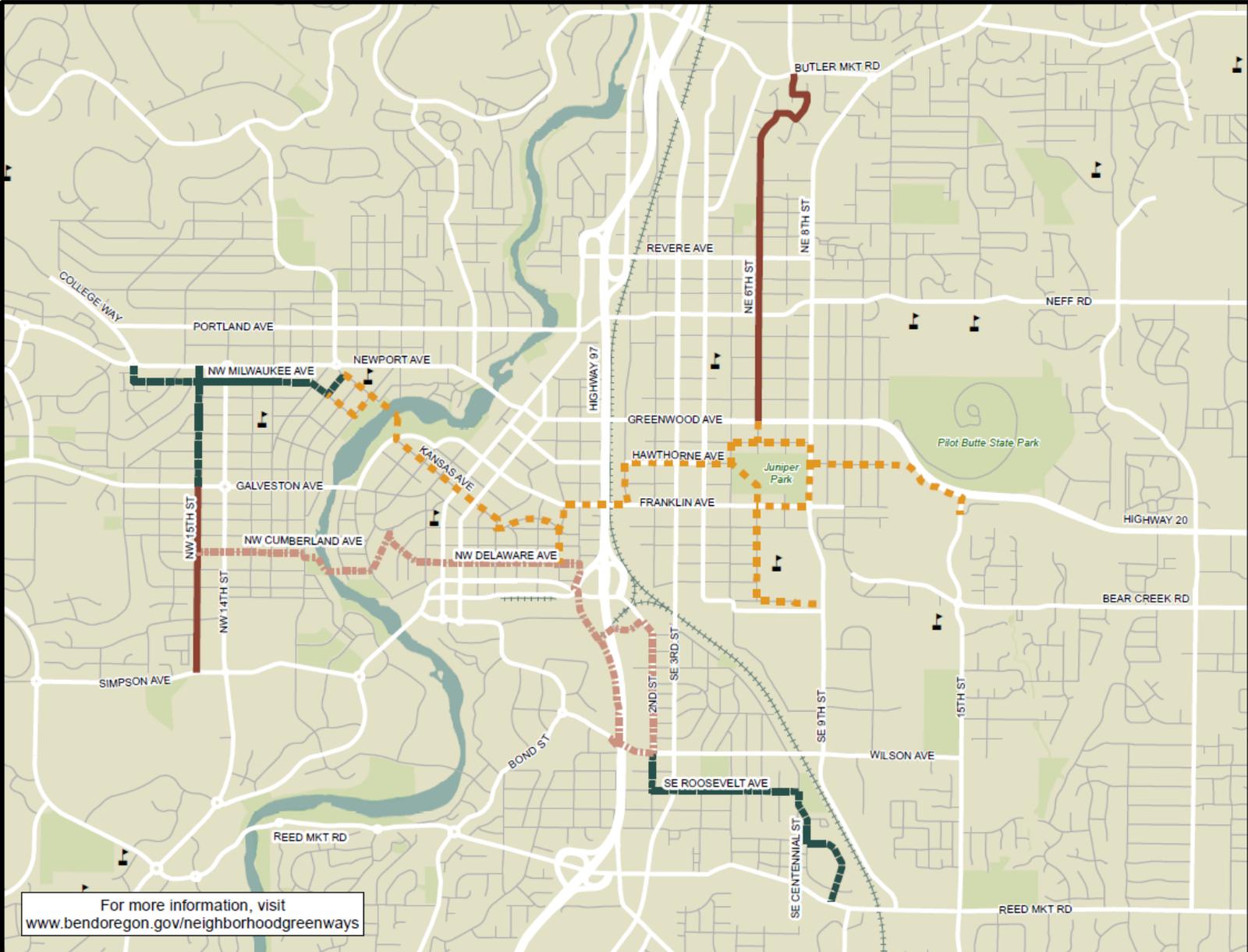


BEST SOLUTION

- When high-stress and barriers -
- Detailed evaluation of how to make it low stress or create the connection
- Looked at posted speed, overall roadway width, whether there was a parallel local street, & context (near school/park/trail)



INITIAL NETWORK OF NEIGHBORHOOD GREENWAYS



2018-2022 NEIGHBORHOOD GREENWAYS

Greenways

(Alignments subject to revision)

- Phase 1
- Phase 2
- Phase 3
- Phase 4

- ++++ Railroad
- Schools
- Deschutes River
- Parks



Map prepared by City of Bend
Print Date: August 31, 2018
Sources: City of Bend, Deschutes County

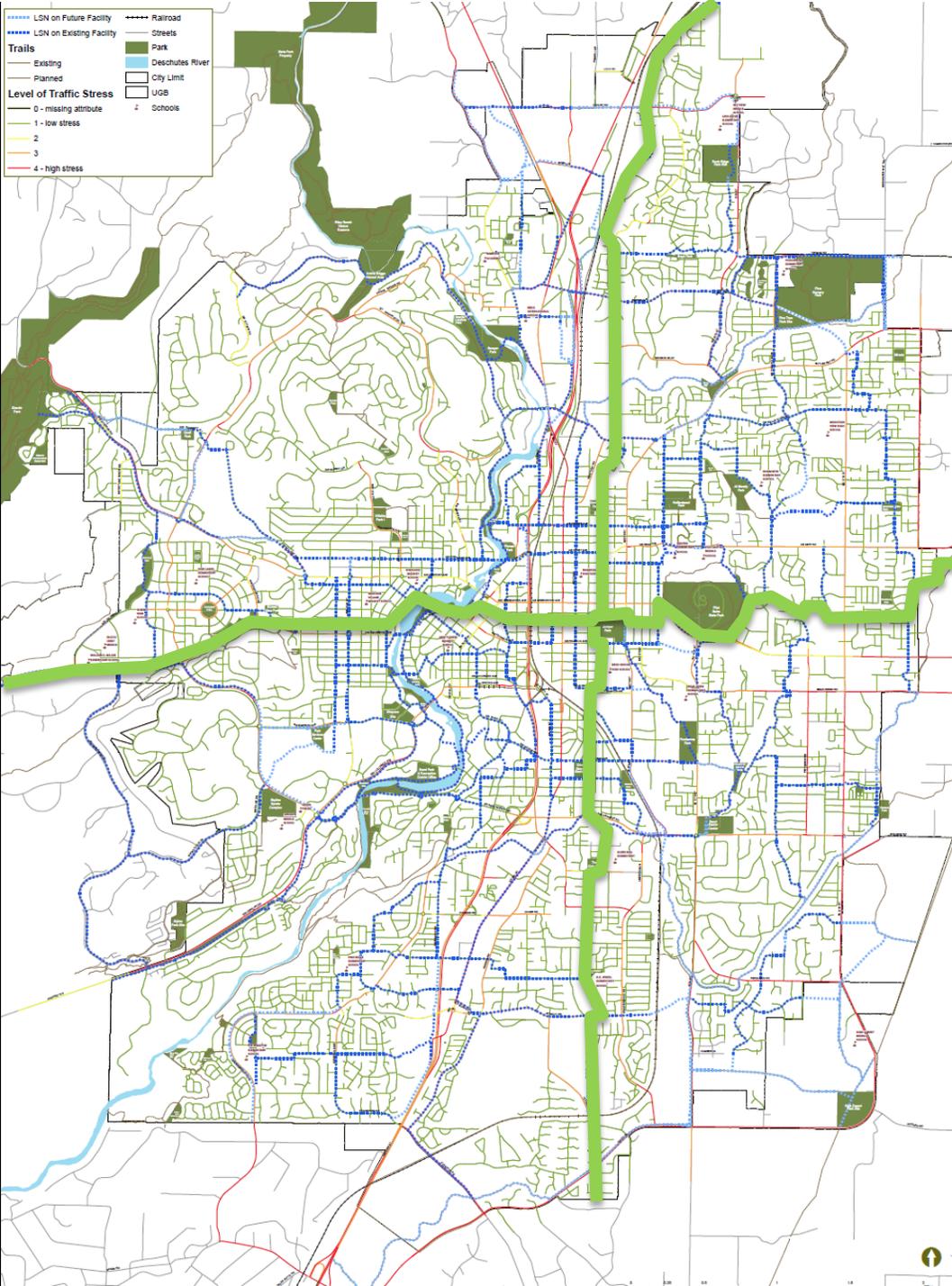


CITY OF BEND

This map is for reference purposes only. Care was taken in the creation of this map, but it is provided "AS IS". Please contact the City of Bend to verify map information or to report any errors.

For more information, visit
www.bendoregon.gov/neighborhoodgreenways

LOW STRESS NETWORK MAP



- Prioritize closing gaps
- Focus on Safe Routes to Schools and Infill Opportunity Areas
- Remove critical barriers

BE EFFICIENT IN DEPLOYMENT: OPPORTUNITIES



Bend Parks and Recreation District:

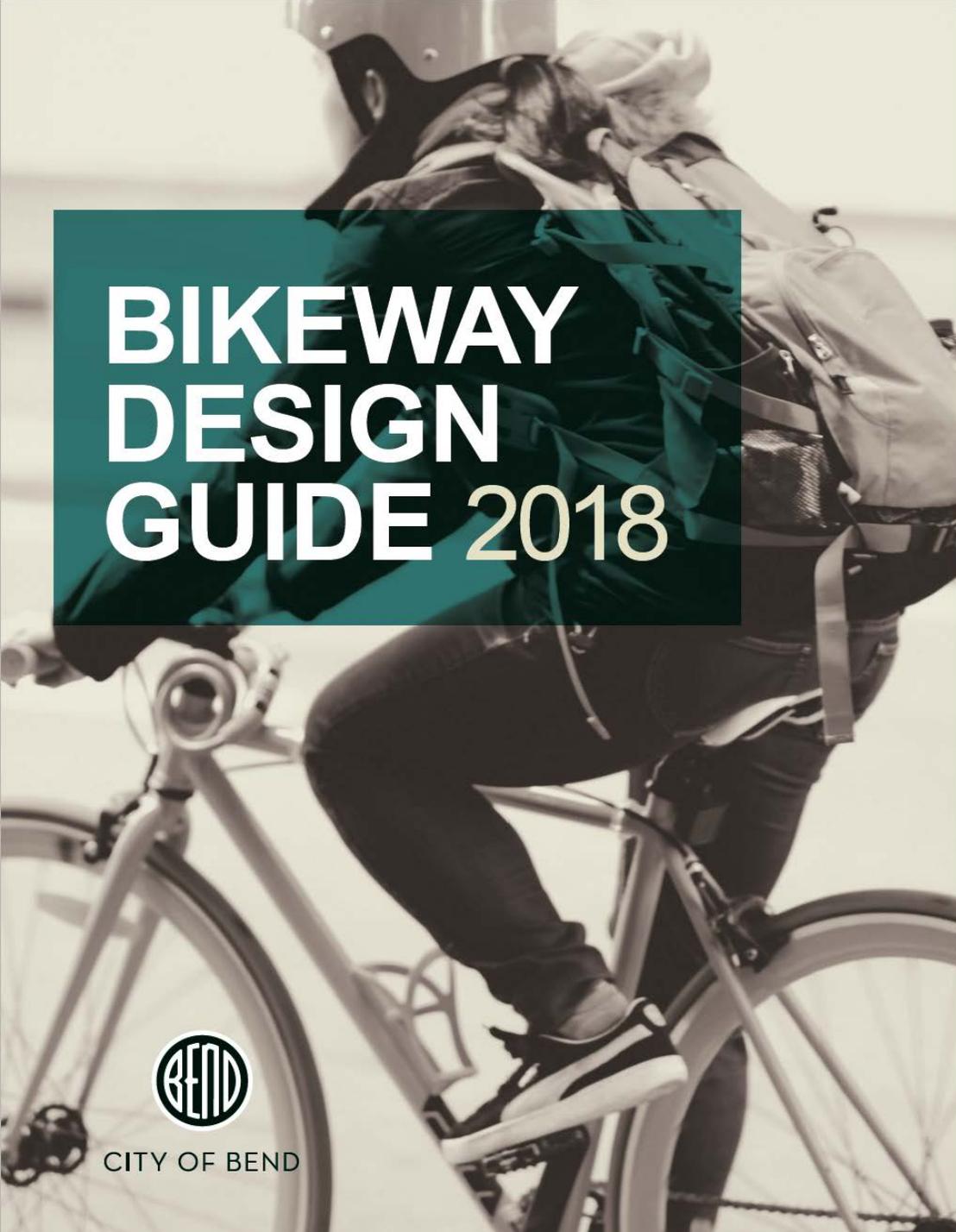
- Connect to Trails and Paths

Oregon Department of Transportation:

- Paralleling & crossing the Parkway

City of Bend:

- Pavement preservation
- New roadways
- Neighborhood greenways



BIKEWAY DESIGN GUIDE 2018

DESIGN GUIDE



- Provide Guidance on Facility Selection
- Formally establish what Low-Stress Bikeway Facilities look like in Bend and how they are maintained



CITY OF BEND

COSTS

COST ESTIMATES



Neighborhood greenways (40 miles proposed)

- \$200K to \$300K per mile

Buffered bike lanes (12 miles proposed)

- \$2K per mile

Shared use paths (36 miles proposed)

- \$1M to \$2M per mile

Bridges

- \$1M to \$6M per bridge



INTEGRATING THE LSN INTO THE TSP



- Include LSN as a baseline assumption for the hybrid scenario (to be considered at the November/December CTAC meetings)
- Develop implementing policies (developed January – March 2019 by CTAC subcommittee)
- Adopt LSN as Bend's Bikeway Map along with implementing policies as part of the TSP
- Develop Design Guidelines for internal City implementation of LSN (in process)