

CYCLE ZONE RATING

FACTOR WEIGHTING

Bikeway Quality	31
Barrier	25
Road Network Density	6
Connectivity	20
Slope	6
Landuse	12

Cycle Zone Analysis (CZA):

A New Bicycle Transportation Planning Tool

Developed for the Update of Portland's Bicycle Master Plan

Legend

- Bikeway Segments
- Cycle Zones
- Portland limits
- Major Waterbodies

Cycle Zone Scores

- 70 - 74
- 62 - 69
- 50 - 61
- 41 - 49
- 32 - 40
- 19 - 31
- 0 - 18

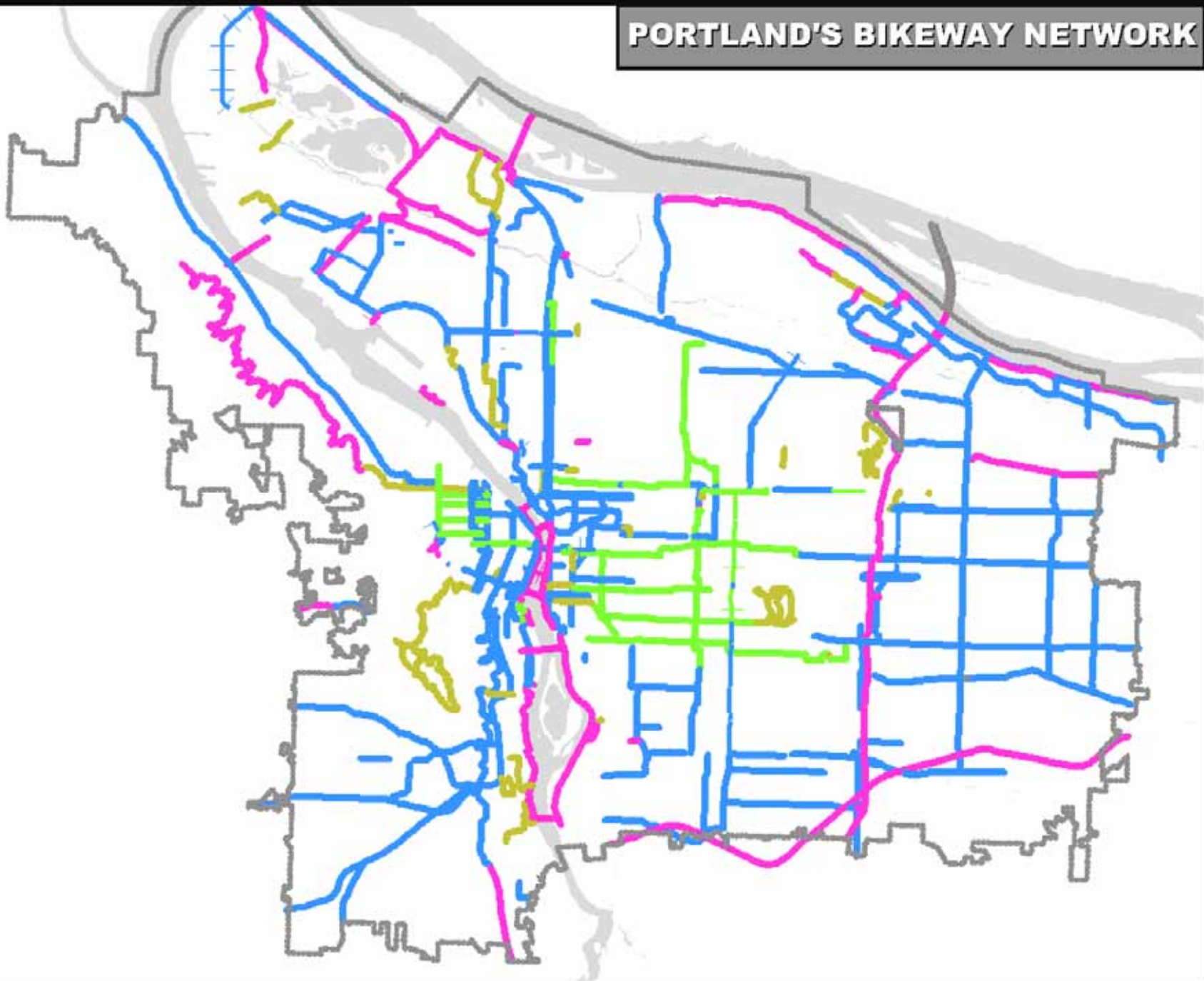
SCENARIO: BQ_Barrier
DATE: 12/18/07



Cycle Zone Analysis

- **Develop a more fine-grained understanding of how cycling conditions differ across Portland**
- **Create divisions that allow us to better tailor treatments to improve conditions**
- **Understand where conditions offer the highest potential to create world class cycling conditions**
- **Create an organizing principle that allows for more nuanced discussion about conditions for bicycling**

PORTLAND'S BIKEWAY NETWORK



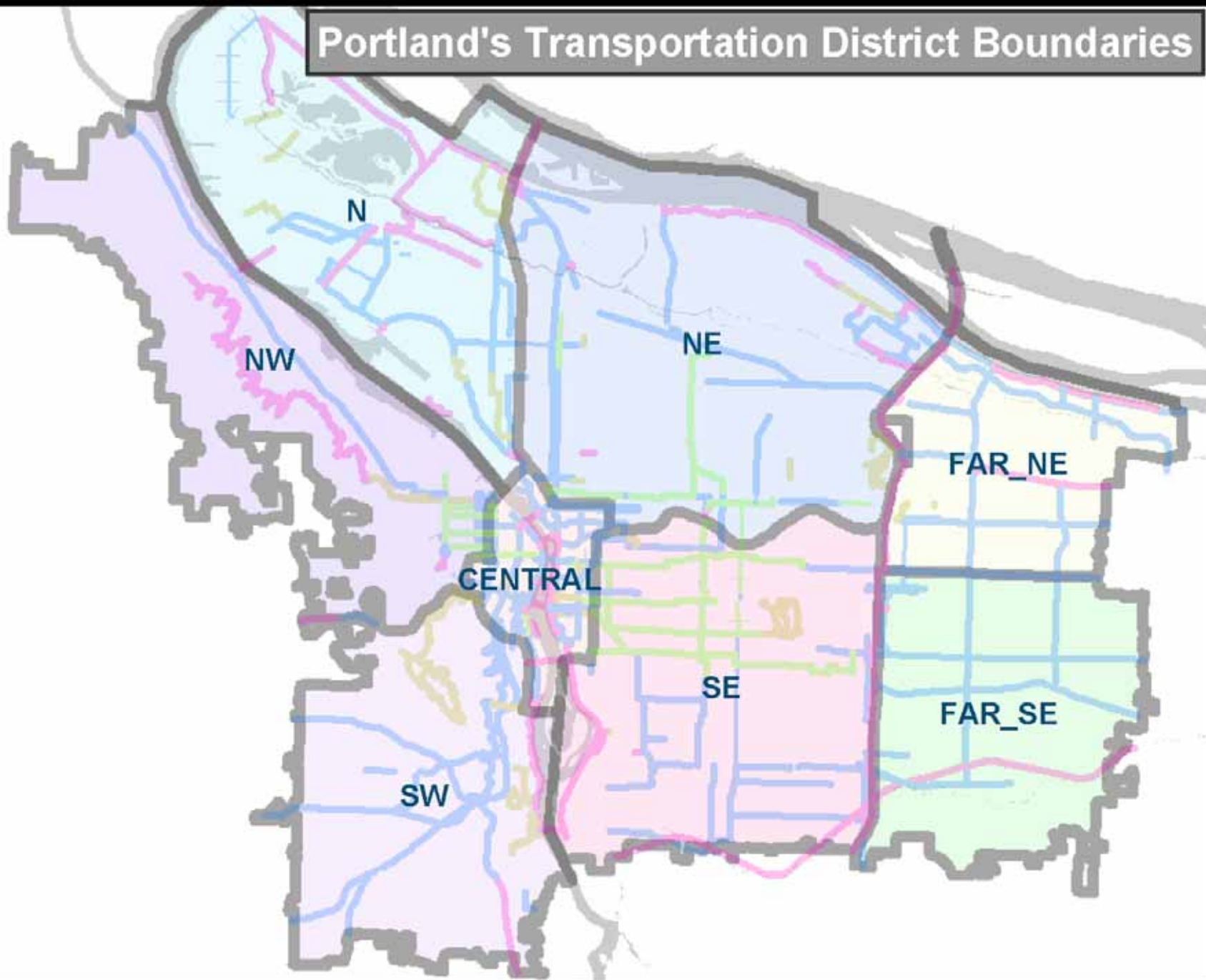
Bicycle Boulevards

A Bicycle Boulevard is a local street with:
(conditions where people feel safe and comfortable on superb facilities)

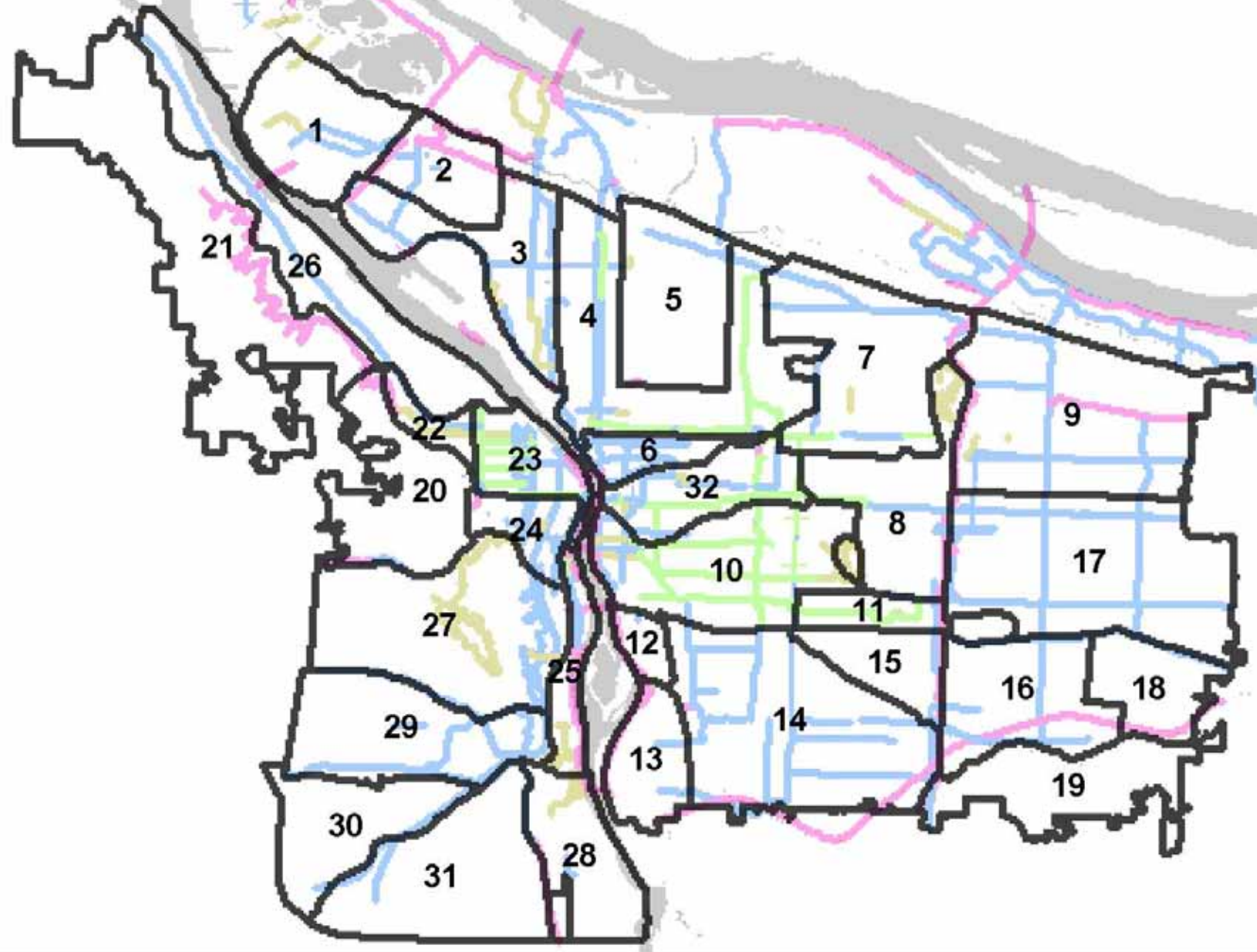
- Low Traffic Volumes
 - **diversion**
- Low Speeds
 - **traffic calming**
- Easy Crossing of Arterial Streets
 - **signalization**
 - **curb extensions**
 - **median refuges**
- Way-Finding
 - **signs, markings**
- Priority for People on Bicycles
 - **impediments to motor vehicles**
 - **bike boxes**
 - **prominent markings**



Portland's Transportation District Boundaries



Portland's 32 Cycle Zones



Drawing Cycle Zone Lines

- **First Cut: local professional expertise (in-house)**
 - Where does cycling feel similar?
 - Where does cycling feel different?
 - What barriers are difficult to cross?
- **Second Cut: advocate expertise**
 - Review by City's Bicycle Advisory Committee with emphasis on local knowledge by area
- **Third Cut: public input**
 - Maps and Crayons

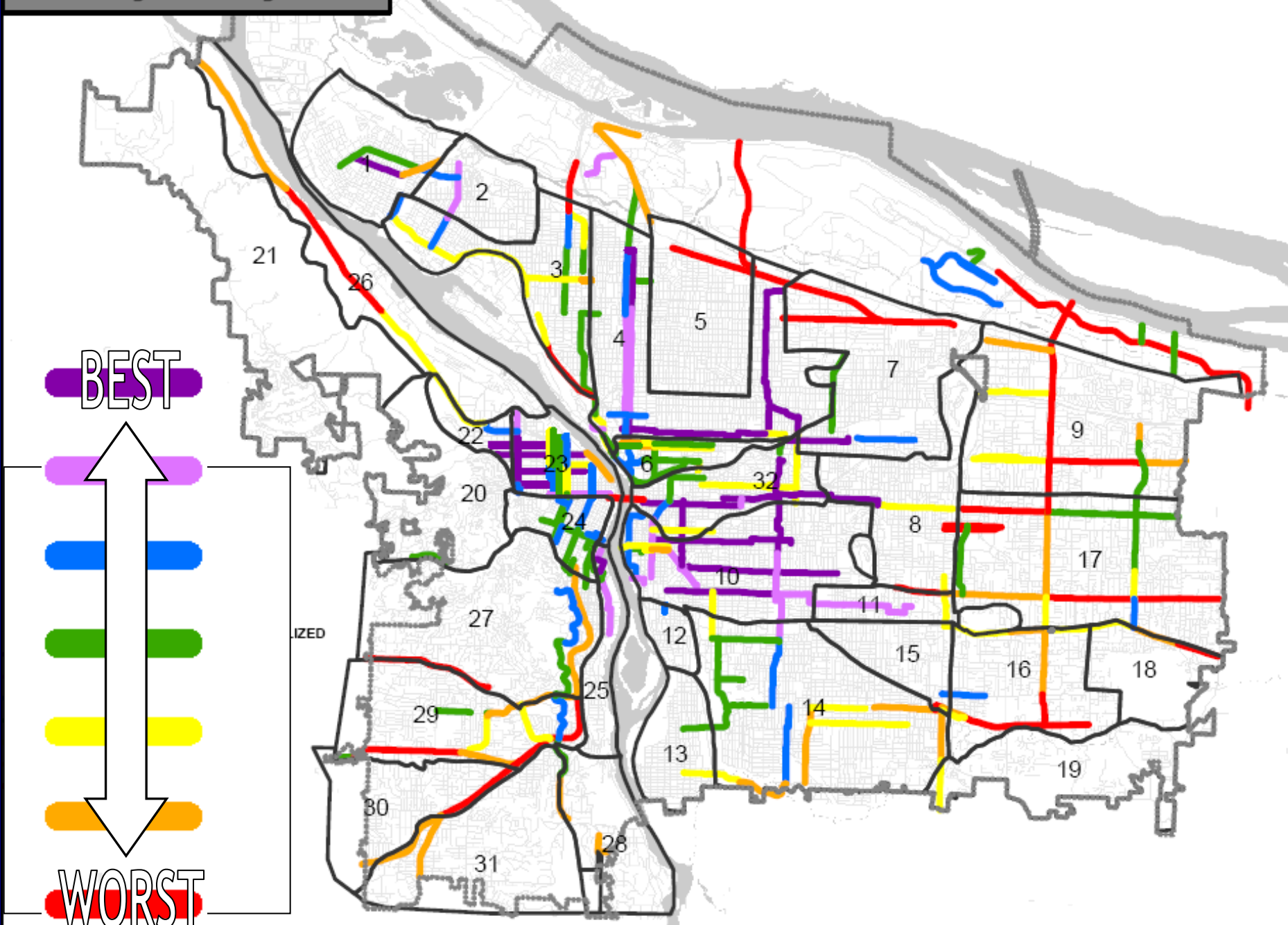
Factors Used to Analyze Cycle Zones

- Quality of the **Bikeway Network**
- Difficulty of the **Barriers**
- **Density** of Roadway Network
- **Connectivity** of Roadway Network
- Severity of **Slope**
- **Land Use** (as proxy for trip distance)

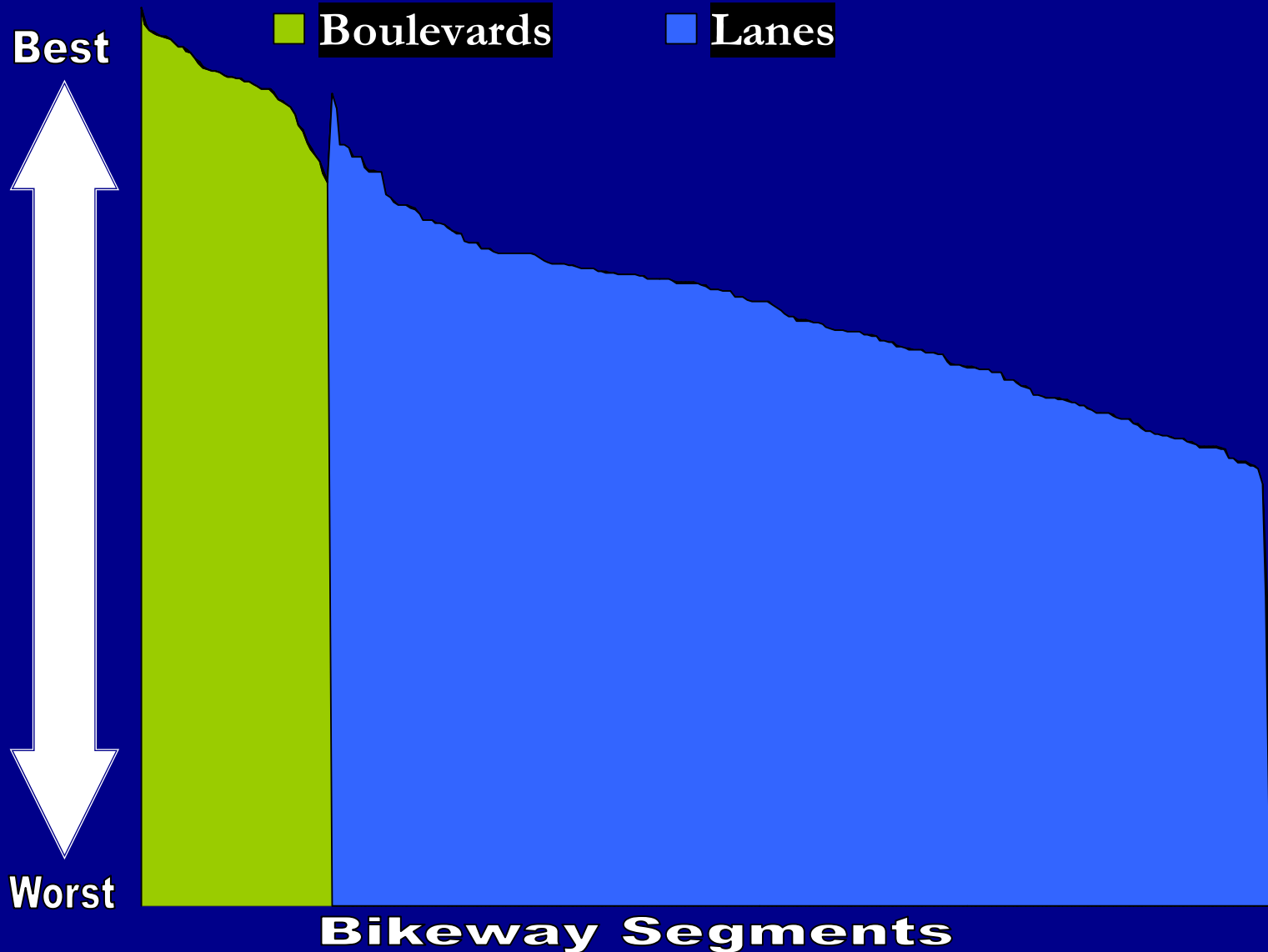
Bikeway Quality Index

- A means to assess relative quality of existing bikeways based upon:
 - Automobile speeds
 - Automobile volumes
 - Dropped bicycle lanes
 - Difficult transitions
 - Number of travel lanes
 - Width of bicycle lanes
 - Jogs in route
 - Quality of pavement
 - Quality of intersection crossings
 - Number of stops

Bikeway Quality Index



Ranking of Bikeway Segments



CYCLE ZONE RATING

Bikeway Quality

FACTOR WEIGHTING

Bikeway Quality	100
Barrier	0
Road Network Density	0
Connectivity	0
Slope	0
Landuse	0

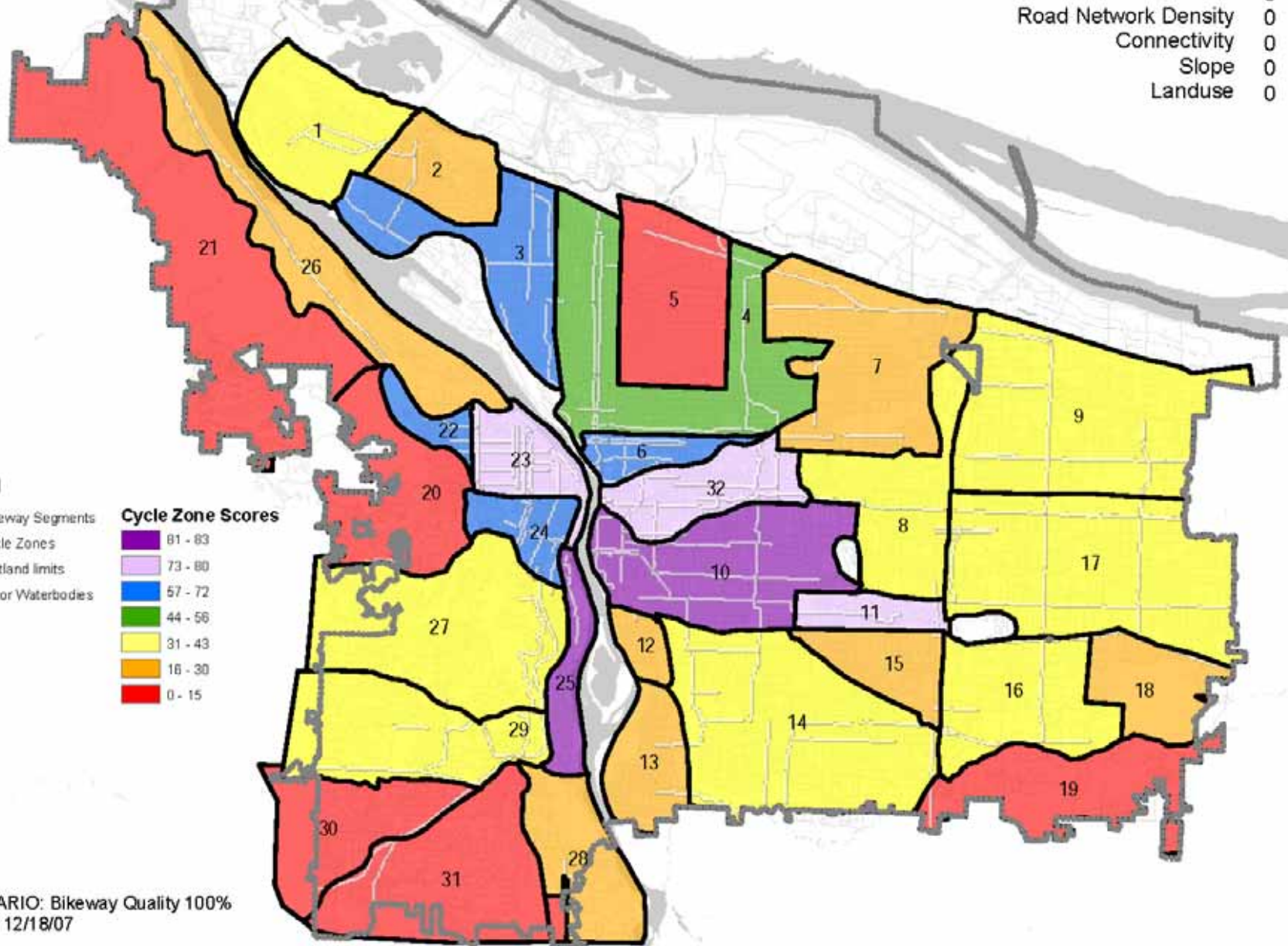
Legend

- Bikeway Segments
- Cycle Zones
- Portland limits
- Major Waterbodies

Cycle Zone Scores

81 - 83
73 - 80
57 - 72
44 - 56
31 - 43
18 - 30
0 - 15

SCENARIO: Bikeway Quality 100%
DATE: 12/18/07



CYCLE ZONE RATING

Barriers

FACTOR WEIGHTING

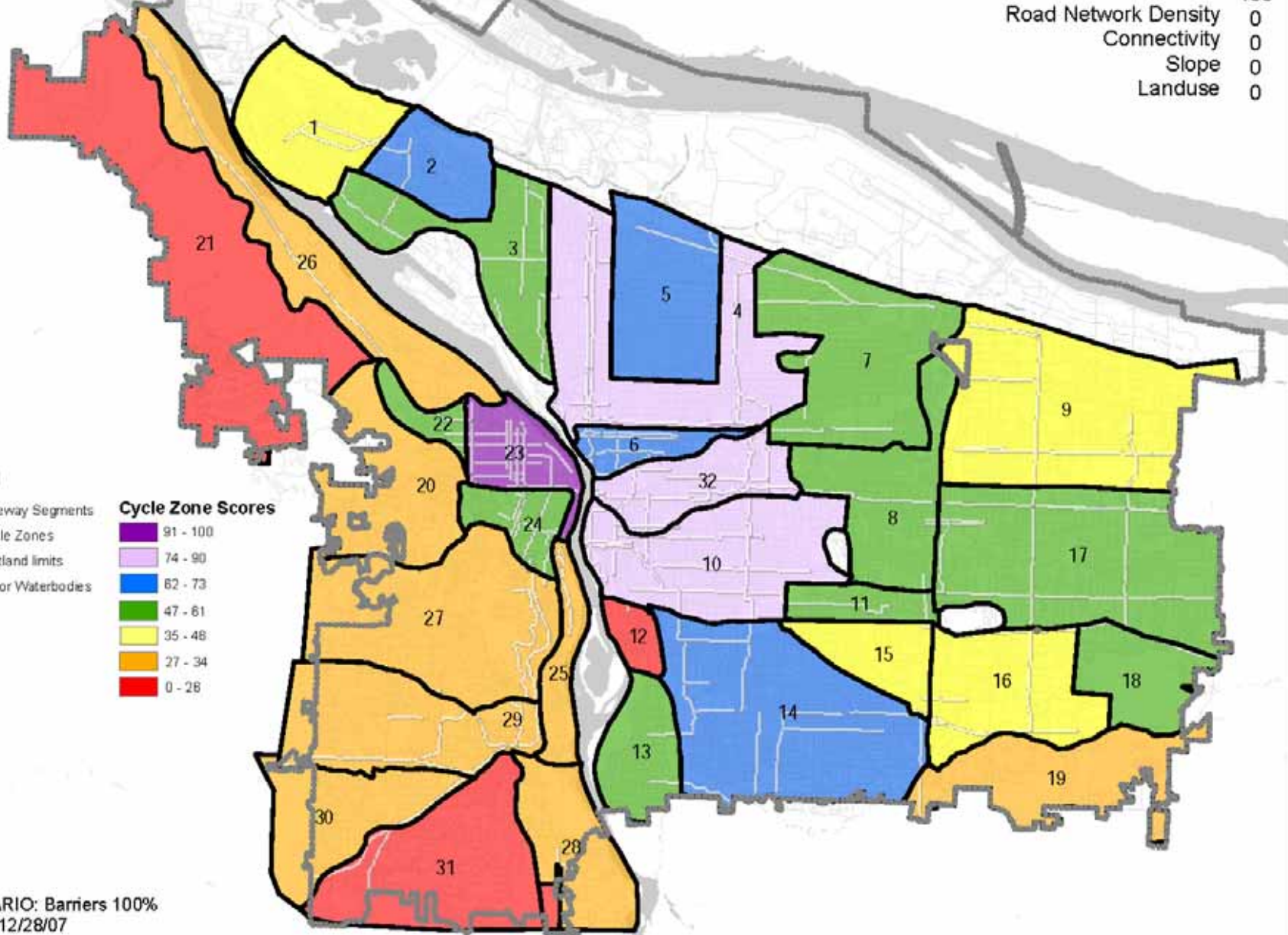
Bikeway Quality	0
Barrier	100
Road Network Density	0
Connectivity	0
Slope	0
Landuse	0

Legend

- Bikeway Segments
- Cycle Zones
- Portland limits
- Major Waterbodies

Cycle Zone Scores

91 - 100
74 - 90
62 - 73
47 - 61
35 - 48
27 - 34
0 - 26



SCENARIO: Barriers 100%
DATE: 12/28/07

CYCLE ZONE RATING

Road Network Density

FACTOR WEIGHTING

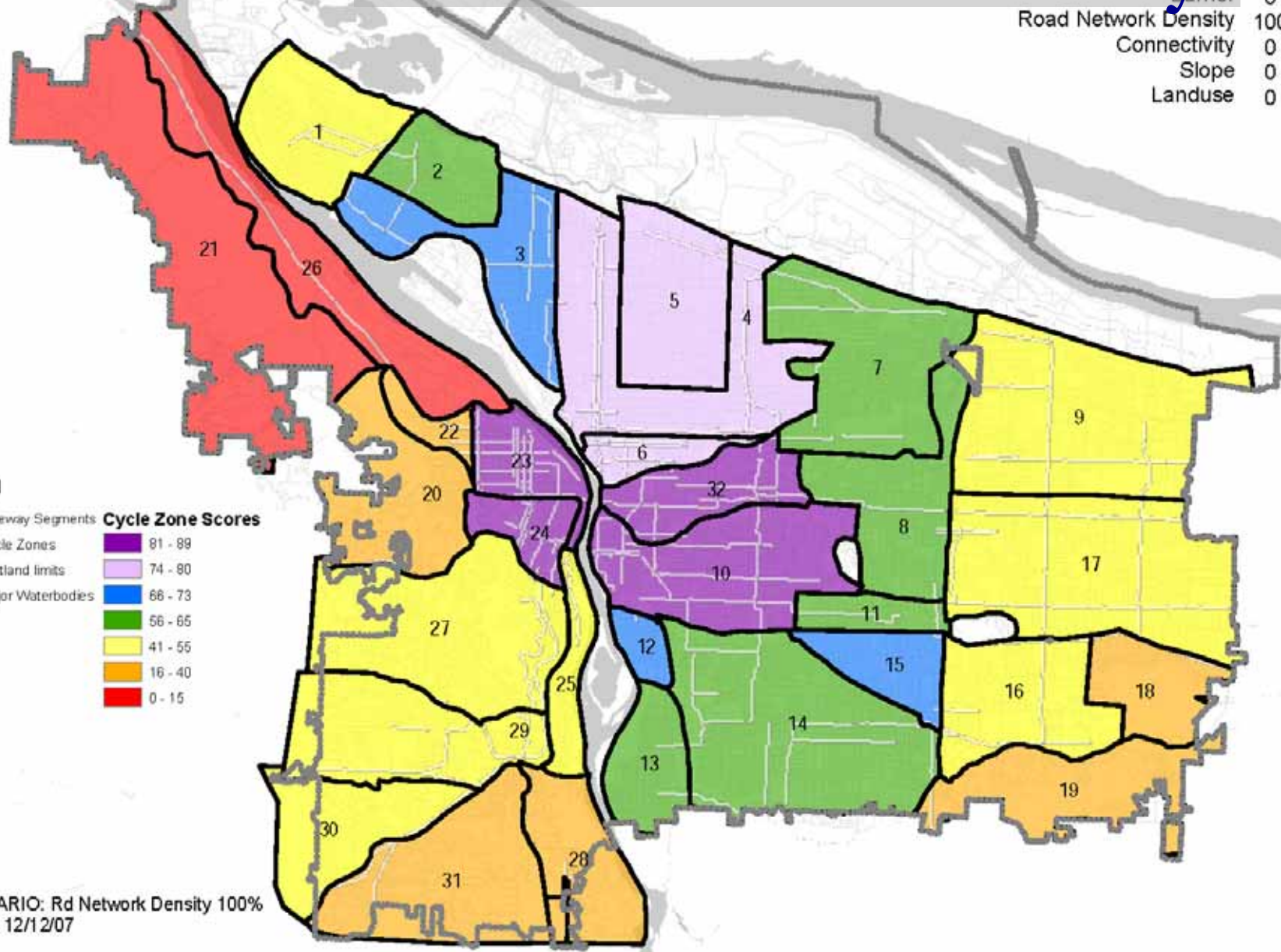
Linearity	0
Barrier	0
Road Network Density	100
Connectivity	0
Slope	0
Landuse	0

Legend

- Bikeway Segments
- Cycle Zones
- Portland limits
- Major Waterbodies

Cycle Zone Scores

- 81 - 89
- 74 - 80
- 66 - 73
- 56 - 65
- 41 - 55
- 16 - 40
- 0 - 15



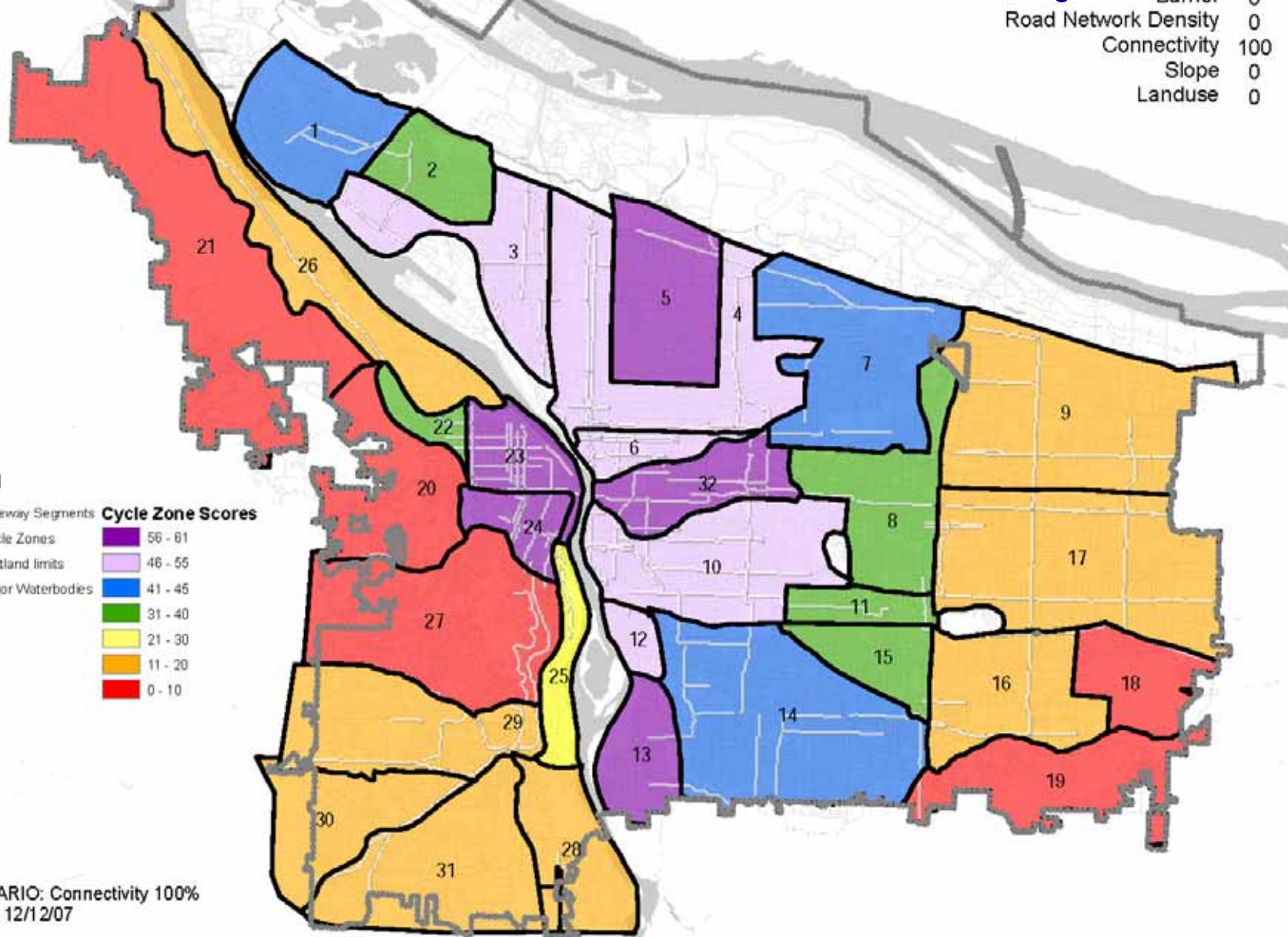
SCENARIO: Rd Network Density 100%
 DATE: 12/12/07

CYCLE ZONE RATING

Street Connectivity

FACTOR WEIGHTING		
Bikeway Quality		0
Barrier		0
Road Network Density		0
Connectivity		100
Slope		0
Landuse		0

Legend



SCENARIO: Connectivity 100%
DATE: 12/12/07

CYCLE ZONE RATING

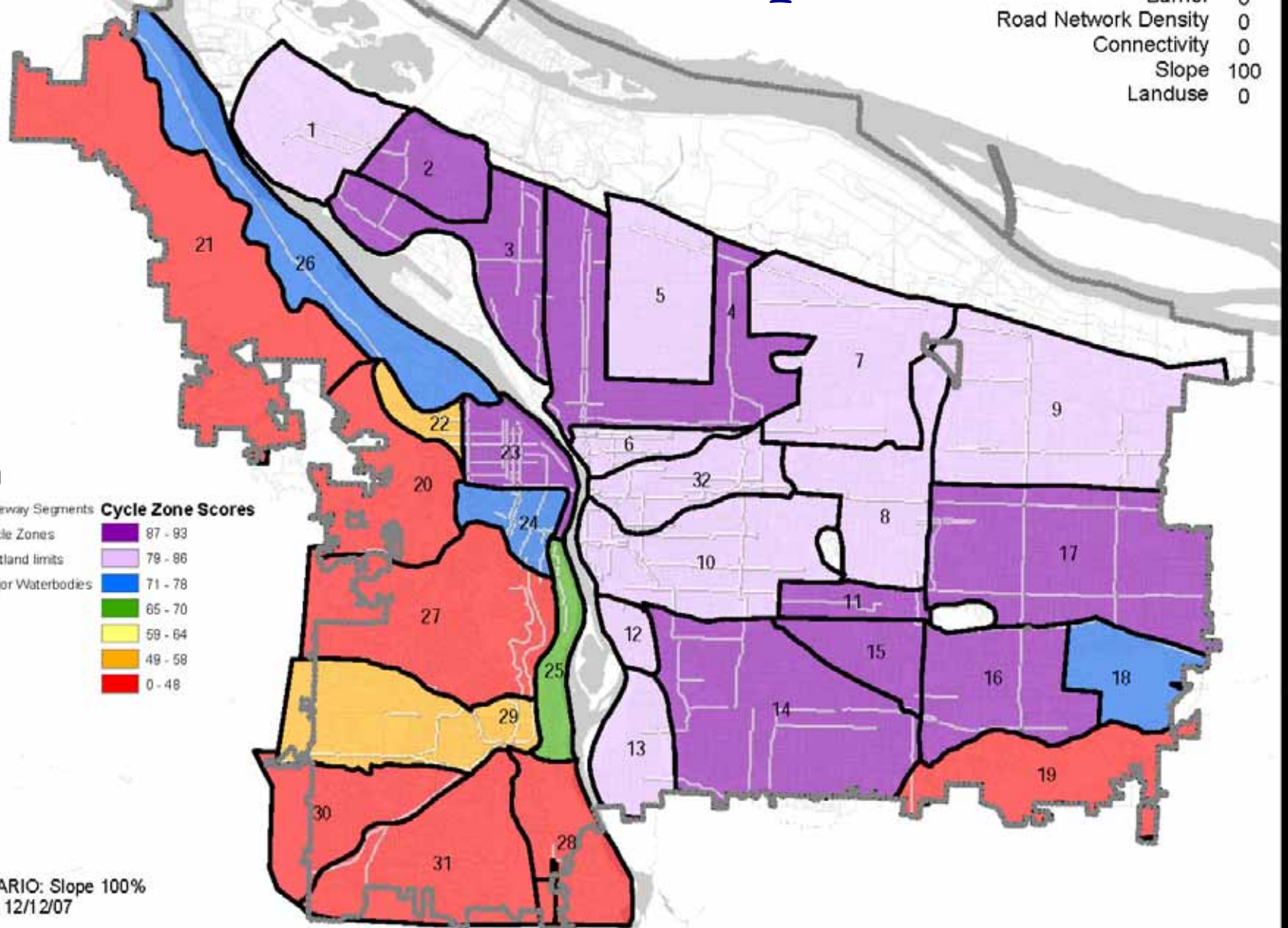
Slope

FACTOR WEIGHTING

Bikeway Quality	0
Barrier	0
Road Network Density	0
Connectivity	0
Slope	100
Landuse	0

Legend

	Bikeway Segments	Cycle Zone Scores
	Cycle Zones	87 - 93
	Portland limits	79 - 86
	Major Waterbodies	71 - 78
		65 - 70
		59 - 64
		49 - 58
		0 - 48



SCENARIO: Slope 100%
DATE: 12/12/07

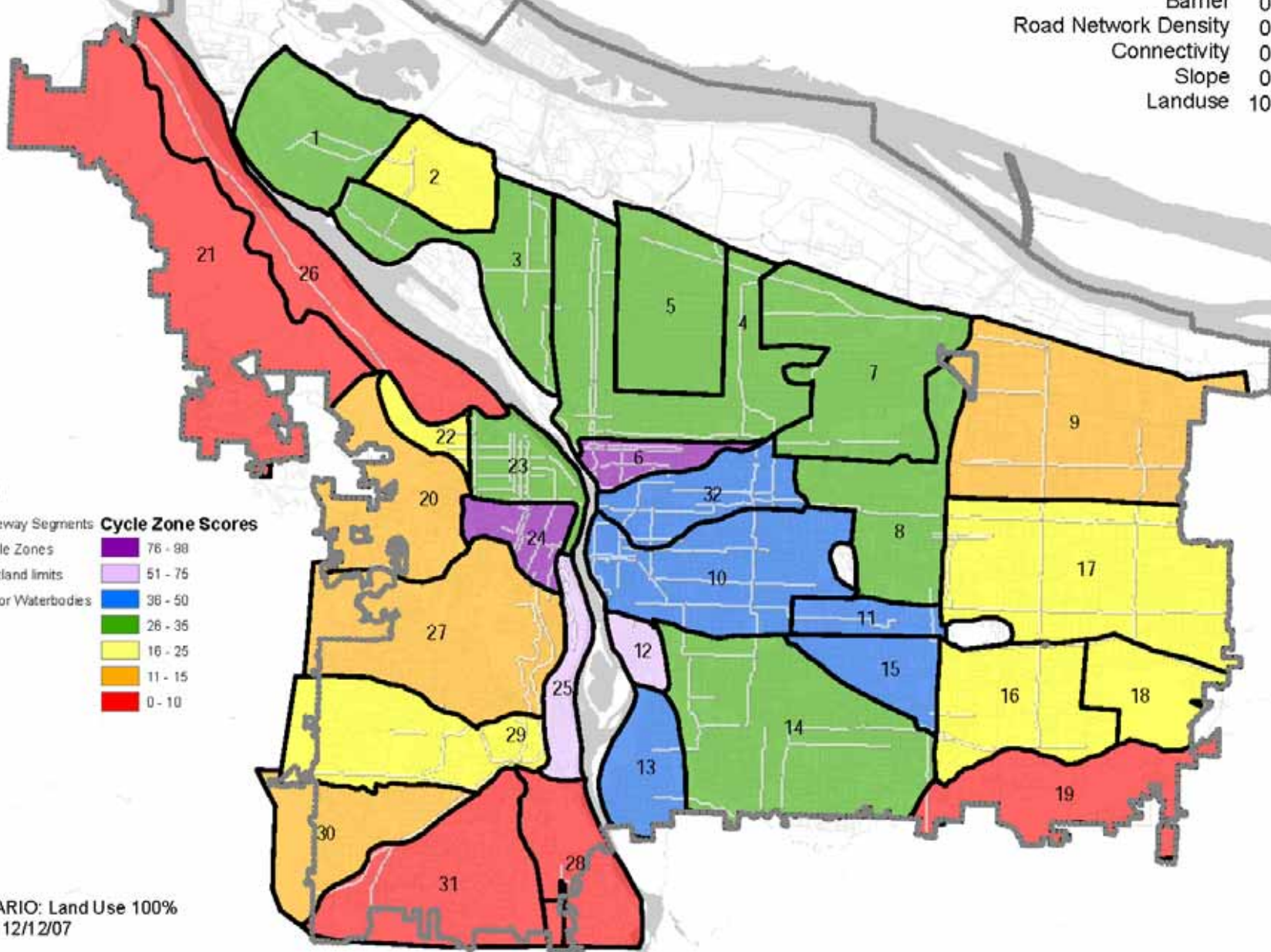
CYCLE ZONE RATING

Land Use

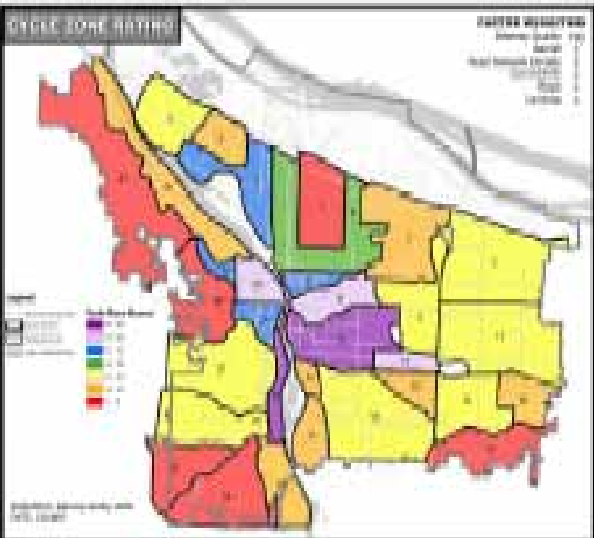
FACTOR WEIGHTING	
Bikeway Quality	0
Barrier	0
Road Network Density	0
Connectivity	0
Slope	0
Landuse	100

Legend

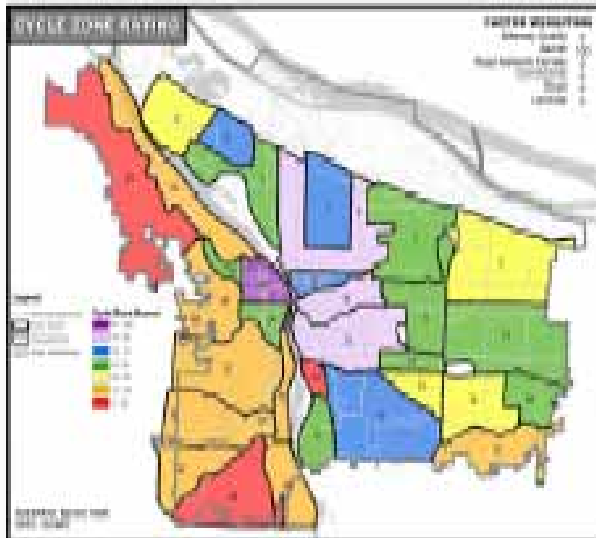
	Bikeway Segments	Cycle Zone Scores
	Cycle Zones	76 - 90
	Portland limits	51 - 75
	Major Waterbodies	38 - 50
		26 - 35
		16 - 25
		11 - 15
		0 - 10



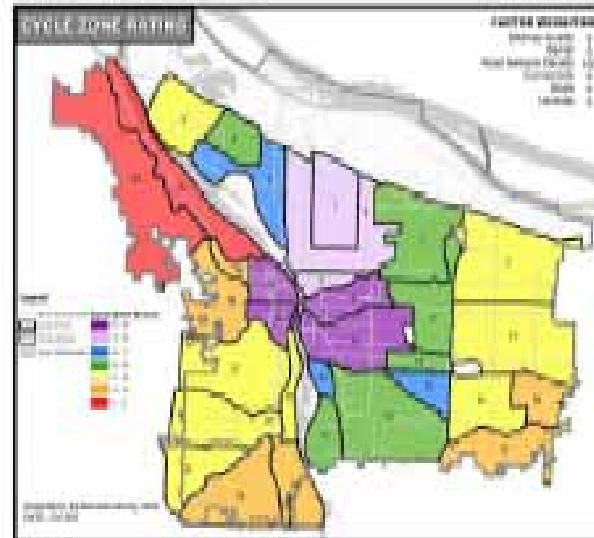
SCENARIO: Land Use 100%
DATE: 12/12/07



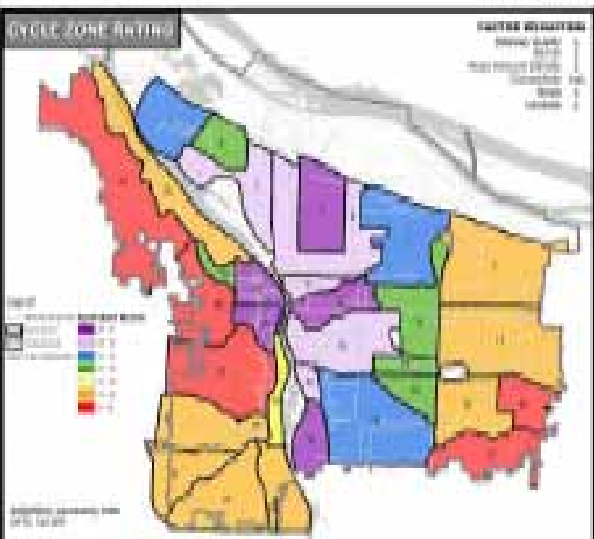
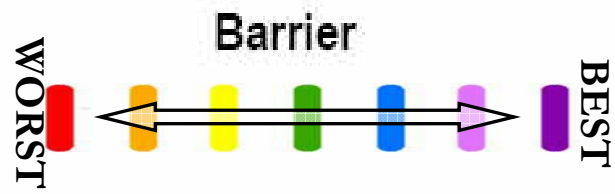
Bikeway Quality



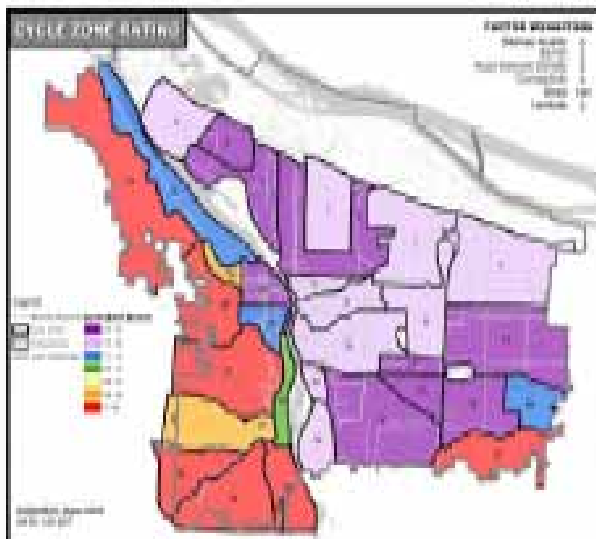
Barrier



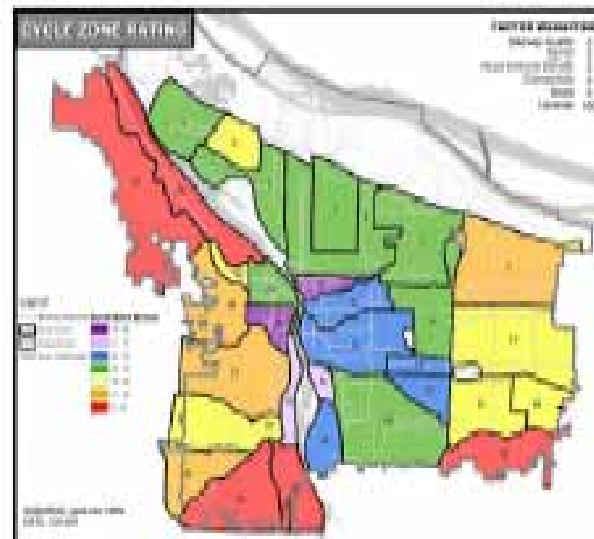
Road Network Density



Roadway Connectivity



Slope



Land Use

CYCLE ZONE RATING

Overall Rating

FACTOR WEIGHTING

Bikeway Quality	31
Barrier	25
Road Network Density	6
Connectivity	20
Slope	6
Landuse	12

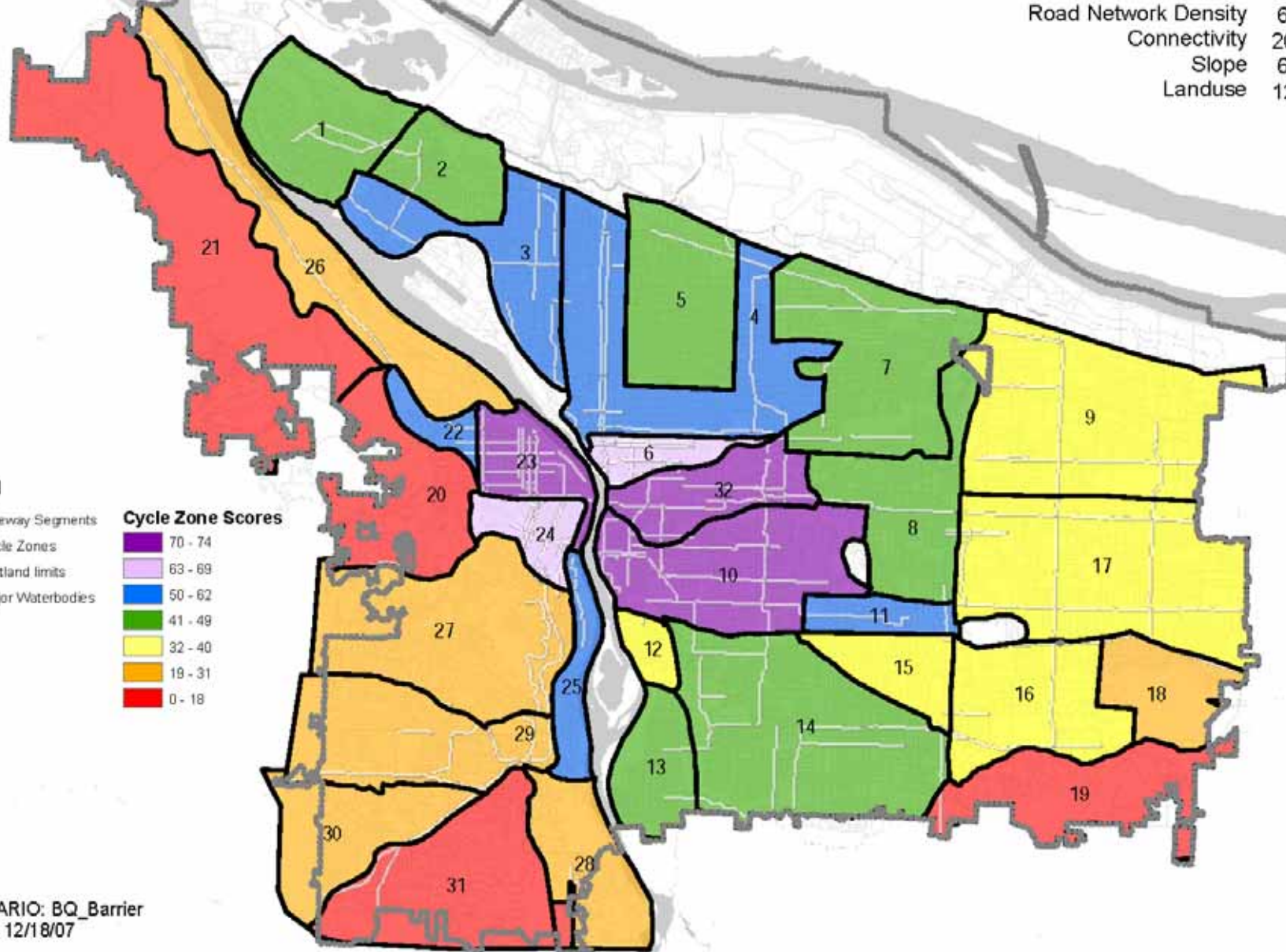
Legend

- Bikeway Segments
- Cycle Zones
- Portland limits
- Major Waterbodies

Cycle Zone Scores

- 70 - 74
- 63 - 69
- 50 - 62
- 41 - 49
- 32 - 40
- 19 - 31
- 0 - 18

SCENARIO: BQ_Barrier
DATE: 12/18/07



Using the Cycle Zone Analysis (CZA)

1. Clearly understanding weaknesses / strengths in each area of the city

Matrix of Conditions by Zone

CYCLE ZONE

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	
Bikeway Quality	Yellow	Orange	Blue	Green	Red	Blue	Orange	Yellow	Yellow	Purple	Light Purple	Orange	Orange	Yellow	Orange	Yellow	Yellow	Orange	Red	Red	Red	Blue	Light Purple	Blue	Purple	Orange	Yellow	Orange	Yellow	Red	Red	Light Purple	
Barriers	Yellow	Blue	Green	Light Purple	Blue	Blue	Green	Green	Yellow	Light Purple	Green	Red	Green	Blue	Yellow	Yellow	Green	Green	Yellow	Yellow	Red	Green	Purple	Green	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Red	Light Purple
Connectivity	Blue	Green	Light Purple	Light Purple	Purple	Light Purple	Blue	Green	Orange	Light Purple	Green	Light Purple	Purple	Blue	Green	Orange	Orange	Red	Red	Red	Red	Green	Purple	Purple	Yellow	Orange	Red	Orange	Orange	Orange	Orange	Purple	
Road Network Density	Yellow	Green	Blue	Light Purple	Light Purple	Light Purple	Green	Green	Yellow	Purple	Green	Blue	Green	Green	Blue	Yellow	Yellow	Yellow	Yellow	Yellow	Red	Yellow	Purple	Purple	Yellow	Red	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Purple
Land Use	Green	Yellow	Green	Green	Green	Purple	Green	Green	Orange	Blue	Blue	Light Purple	Blue	Green	Blue	Yellow	Yellow	Yellow	Red	Orange	Red	Yellow	Green	Purple	Light Purple	Red	Orange	Red	Yellow	Orange	Red	Red	Blue
Slope	Light Purple	Light Purple	Purple	Purple	Light Purple	Light Purple	Light Purple	Light Purple	Light Purple	Light Purple	Purple	Light Purple	Light Purple	Purple	Purple	Purple	Purple	Blue	Red	Red	Red	Orange	Purple	Blue	Green	Blue	Red	Red	Orange	Red	Red	Red	Light Purple

2. Identifying Areas of Highest Potential for Bicycling

CYCLE ZONE RATING

Bicycling Potential

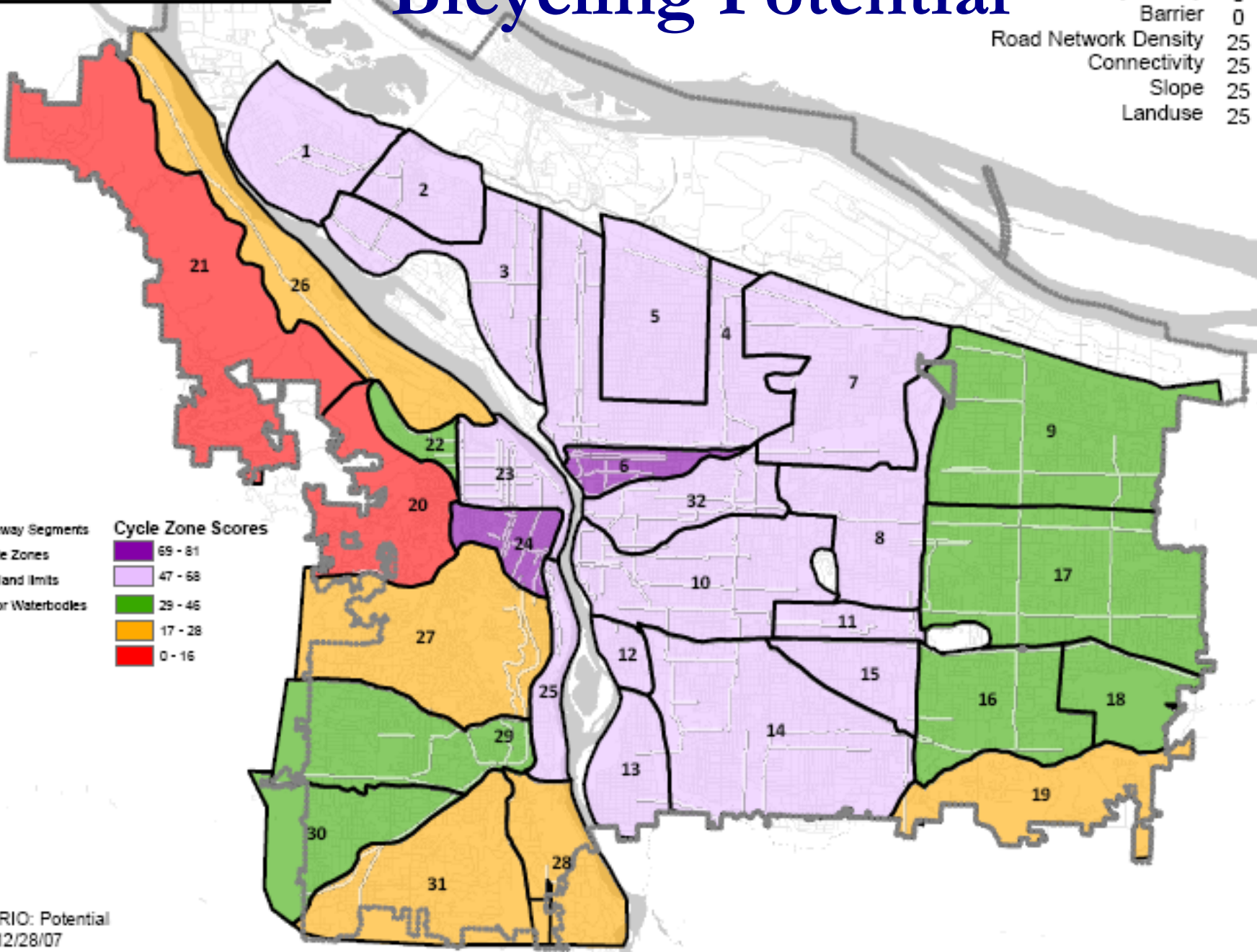
FACTOR WEIGHTING

Bikeway Quality	0
Barrier	0
Road Network Density	25
Connectivity	25
Slope	25
Landuse	25

- Legend**
- Bikeway Segments
 - Cycle Zones
 - Portland limits
 - Major Waterbodies

Cycle Zone Scores

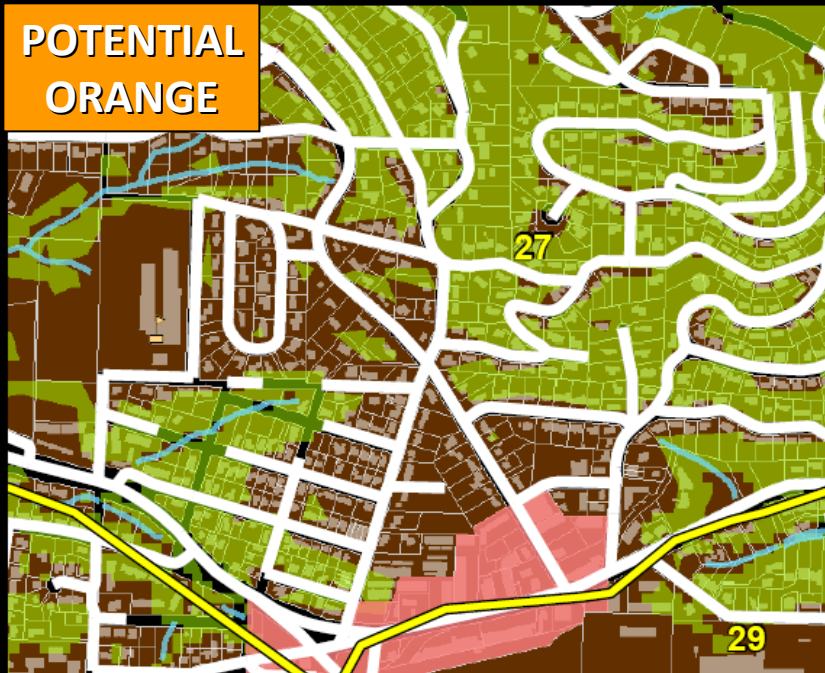
69 - 81
47 - 68
29 - 46
17 - 28
0 - 16



SCENARIO: Potential
DATE: 12/28/07

POTENTIALS COMPARED

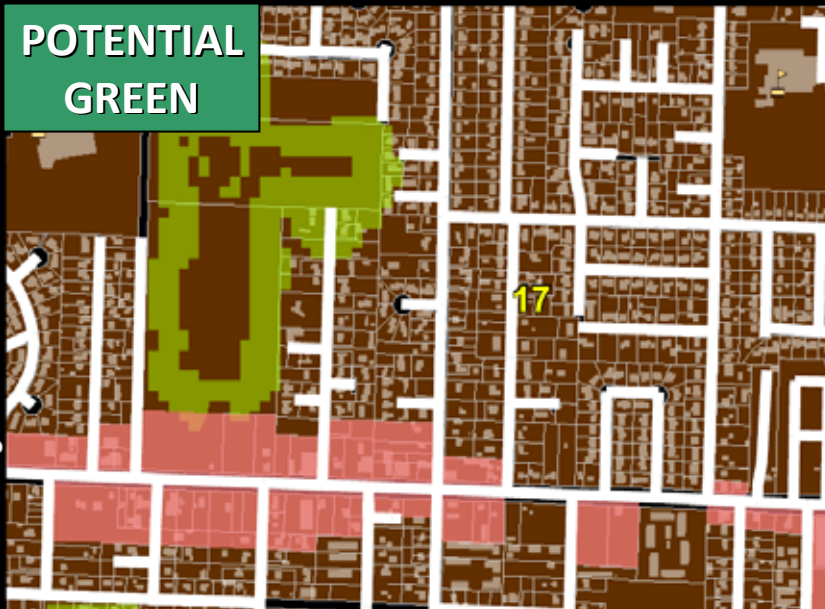
CYCLE ZONE 27 - SOUTHWEST



CYCLE ZONE 10 - INNER EAST



CYCLE ZONE 17 - OUTER EAST



CYCLE ZONE 24 - CITY CENTER



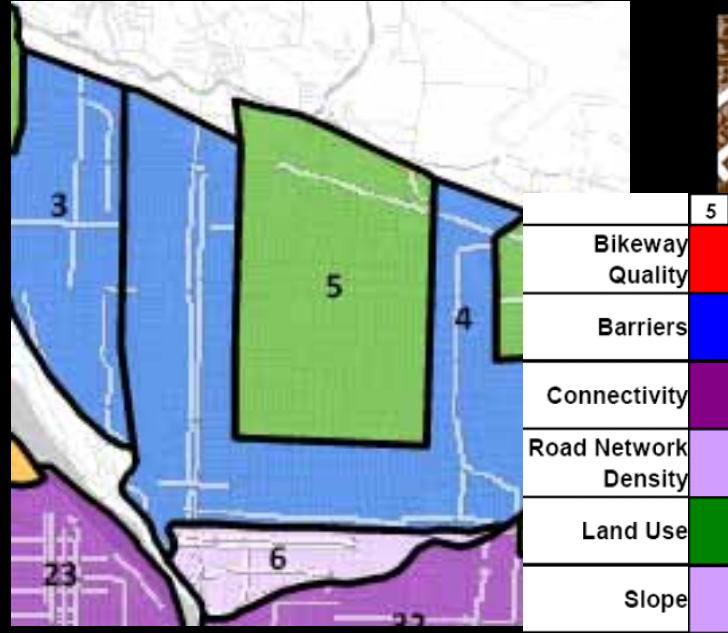
Legend

- Cycle Zones
- Streets
- Commercial
- Slope > 20%
- Stream
- Schools

Scale 1:5,660

EXISTING VS. POTENTIAL RATING

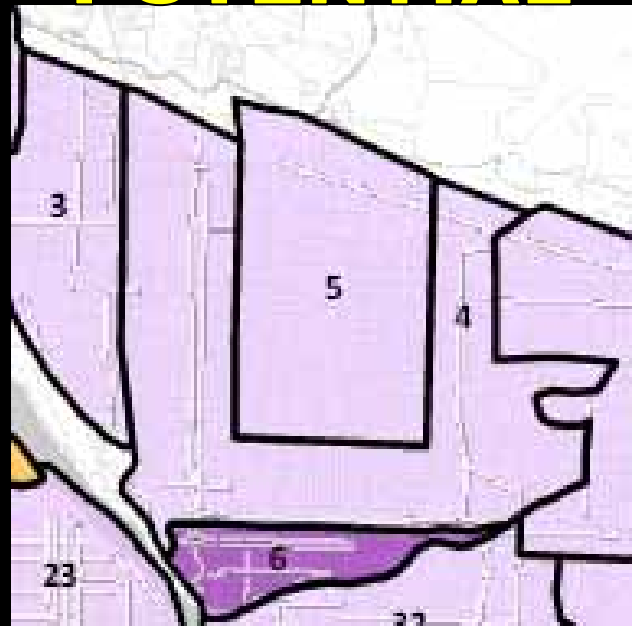
OVERALL RATING



CYCLE ZONE 5 - CONCORDIA

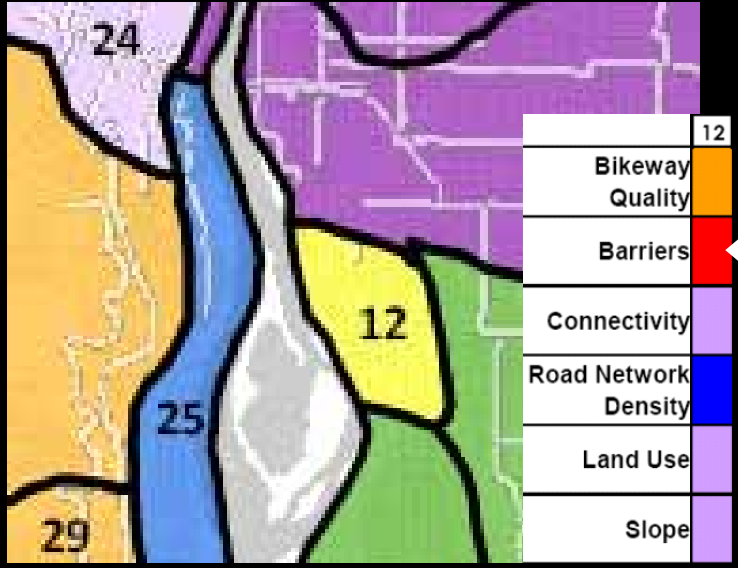


POTENTIAL



EXISTING VS. POTENTIAL RATING

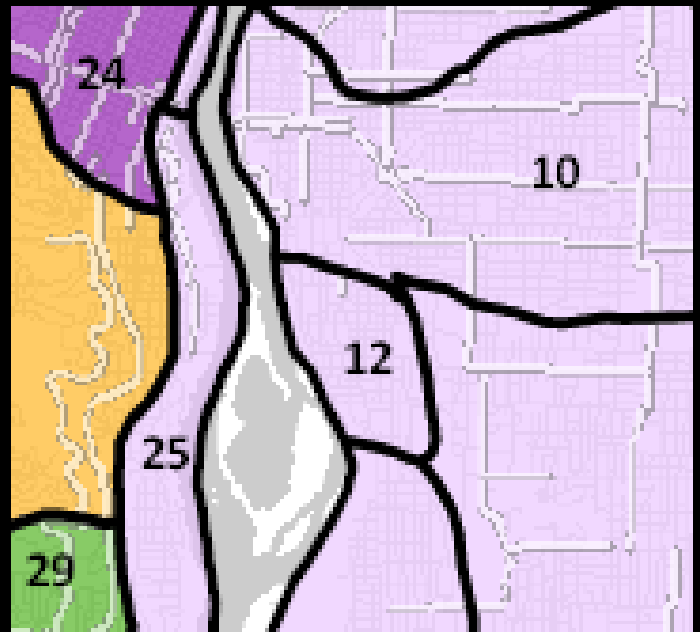
OVERALL RATING



CYCLE ZONE 12 - BROOKLYN



POTENTIAL



3. Tailoring Solutions that permit nuanced considerations

CYCLE ZONE GROUPINGS

characteristics → strategy

GROUPS	Group 1 NW	Group 2 Inner SW	Group 3 Outer SW	Group 4 Central West	Group 5 Outer North	Group 6 Inner N-NE	Group 7 Central East	Group 8 Inner East	Group 9 Outer East	Group 10 Far SE
Cycle Zones	20,21,26	27,29	30,31,28	22,23, 24,25	1,2	3,4,5	6,10,12,32	7,8,11, 13,14,15	9,16,17	18,19
Road Network Density	WORST	POOR	POOR	BEST	MOD	GOOD	BEST	GOOD	POOR	POOR
Connectivity	WORST	POOR	POOR	GOOD	MOD	GOOD	BEST	MOD- GOOD	POOR	WORST
Land Use	WORST	POOR	WORST	BEST	MOD	MOD	GOOD	MOD- GOOD	POOR	WORST
Slope	WORST	POOR	WORST	GOOD	GOOD	BEST	GOOD	BEST	GOOD	WORST
POTENTIAL	LOWEST	MED	LOW	HIGH- TOP	HIGH	HIGH	HIGH- TOP	HIGH	MED	LOW
STRATEGY	<ul style="list-style-type: none"> •Access to Transit •Direct Thru Routes w/ Wide Bike Lanes 	<ul style="list-style-type: none"> •Access to Retail •Access to Transit •Safe Crossings •Connect Gaps •Direct Thru Routes w/ Wide Bike Lanes 	<ul style="list-style-type: none"> •Access to Transit •Direct Thru Routes w/ Wide Bike Lanes 	<ul style="list-style-type: none"> •Bicycle Districts •All Streets Access •Comfort in Mixed Traffic 	<ul style="list-style-type: none"> •Access to Retail •Access to Transit •Safe Crossings •Direct Thru Routes w/ Wide Bike Lanes 	<ul style="list-style-type: none"> •Fine Bikeway Network Mesh •Low Traffic Priority Bike Streets •Maximize Proximity to Commercial 	<ul style="list-style-type: none"> •Fine Bikeway Network Mesh •Low Traffic Priority Bike Streets •Maximize Proximity to Commercial 	<ul style="list-style-type: none"> •Fine Bikeway Network Mesh •Low Traffic Priority Bike Streets •Maximize Proximity to Commercial 	<ul style="list-style-type: none"> •Access to Transit •Connect Gaps •Direct Thru Routes w/ Wide Bike Lanes 	<ul style="list-style-type: none"> •Direct Thru Routes w/ Wide Bike Lanes

Cycle Zone Groupings

characteristics → strategy

COLOR	RANK	CZ GROUP FINDINGS	STRATEGY/FOCUS
Red	Worst	Highest Rd Net. Density, Land Use Mix & Connectivity	Bicycle Districts
Orange & Yellow	Poor	↑ Land Use Mix	Maximize Proximity to Retail
Green	Moderate	↑ Rd Network Density ↑ Land Use Mix	Fine Bikeway Mesh Low Traffic Bike Priority Streets
Blue & Indigo	Good	Land Use Mix = Poor	Access to Commercial/Centers
Violet	Best	↓ Rd Network Density ↓ Connectivity	Direct Routes w/ Wide Bike Lanes
		↑ Degree of Slope ↓ Outside CC Buffer (5mi)	Access to Transit
		↓ Connectivity ↑ Degree of Steep Slope	Connect Network Gaps

4. Promoting highest potential areas to business interests.

CYCLE ZONE RATING

**3 mile radius from Lloyd District
(home to 145,000 Portlanders)**

FACTOR WEIGHTING

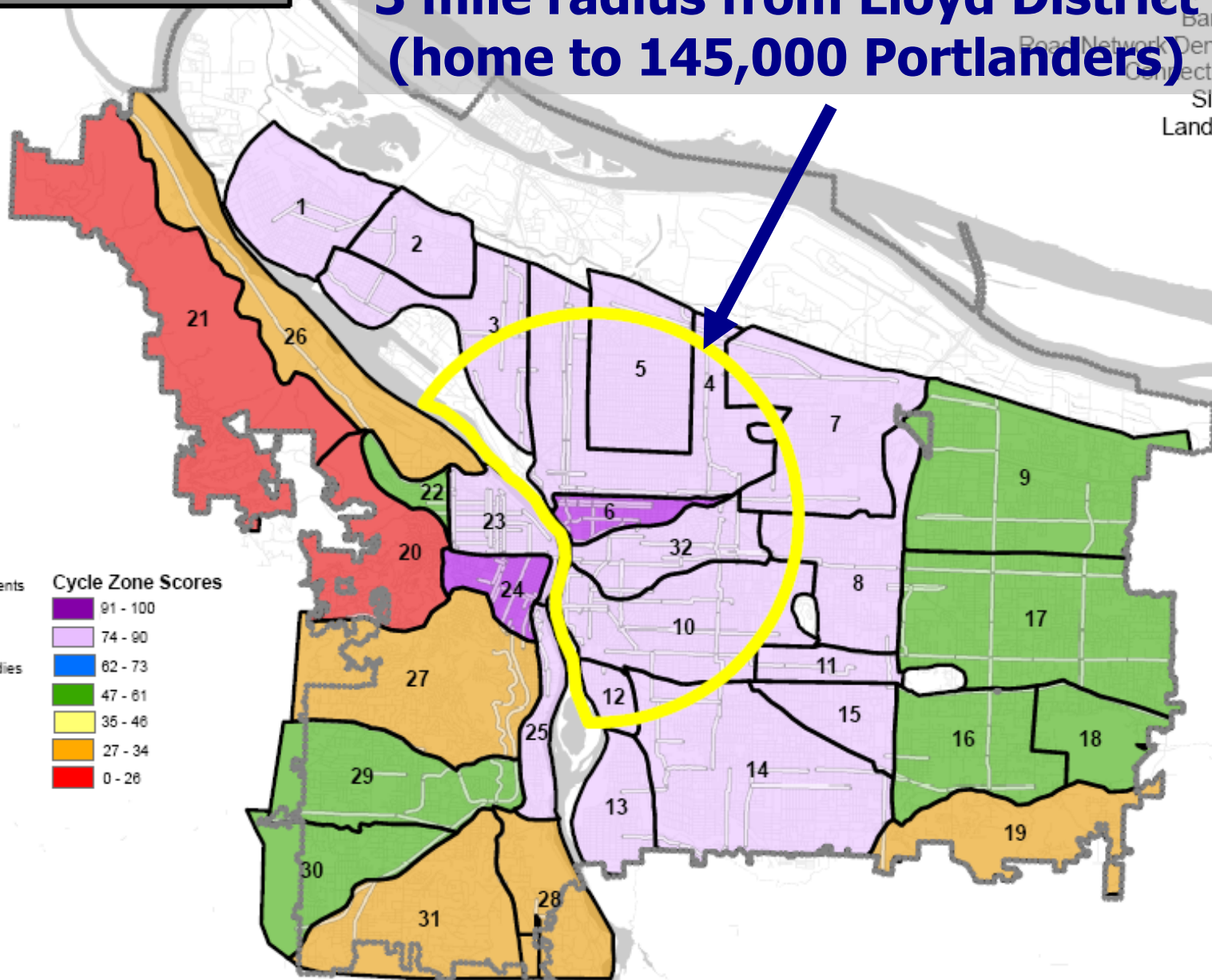
Quality	0
Barrier	0
Road Network Density	25
Connectivity	25
Slope	25
Landuse	25

Legend

- Bikeway Segments
- Cycle Zones
- Portland limits
- Major Waterbodies

Cycle Zone Scores

91 - 100
74 - 90
62 - 73
47 - 61
36 - 46
27 - 34
0 - 26



Imagine Downtown / Lloyd District

Boldly Marked Bikeways



PDOT/Denver I.

Bicycle-friendly routes
(Broadway, Burnside?)



Potential
Purple



Safe ped-bike
Car-free zones



PDOT/Denver I.

Contraflow bicycle lanes

5. Showing Relationship Between Bikeway Quality, Cycle Zone Quality and Ridership

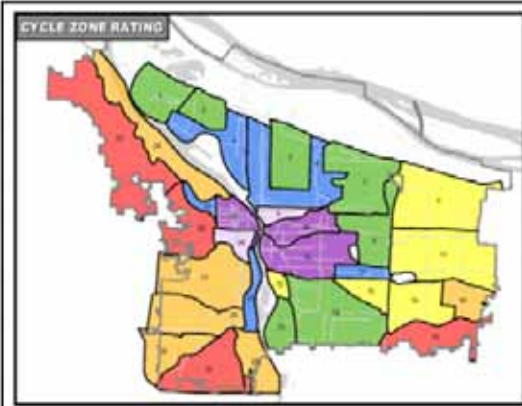
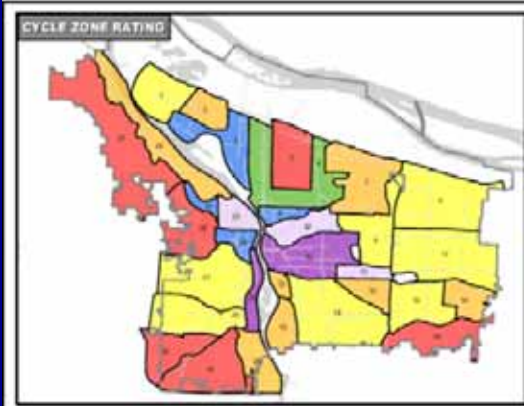
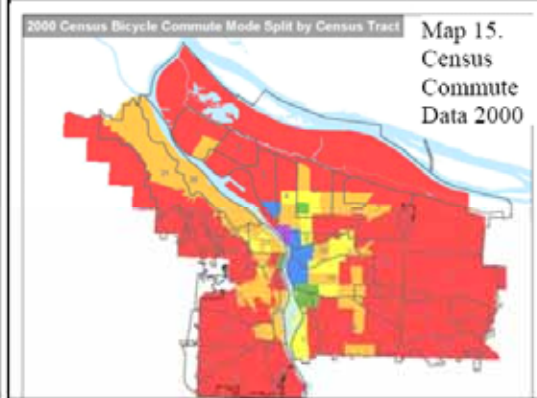
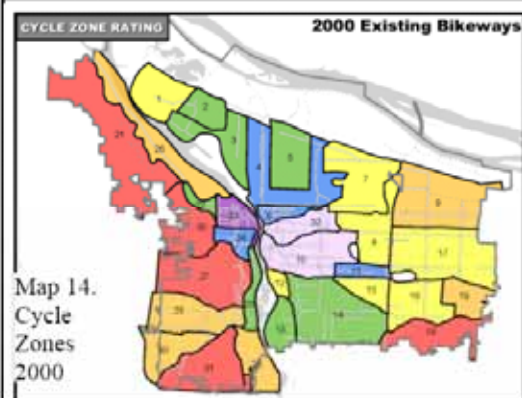
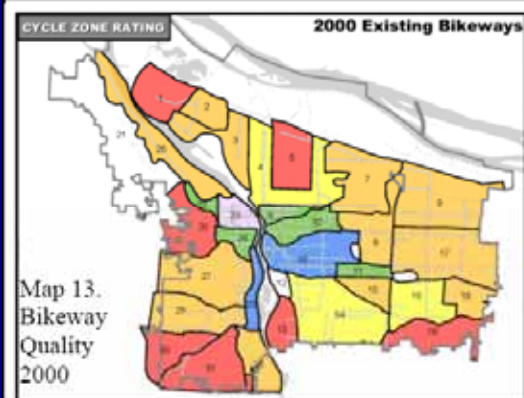
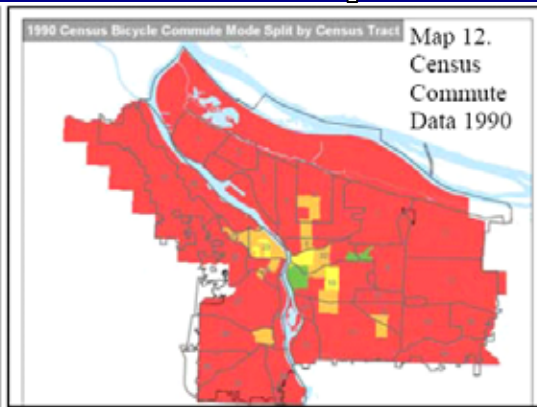
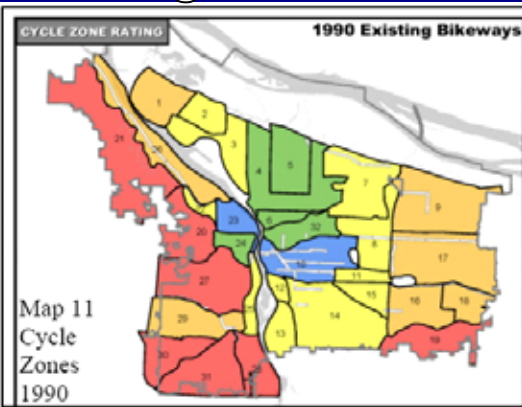
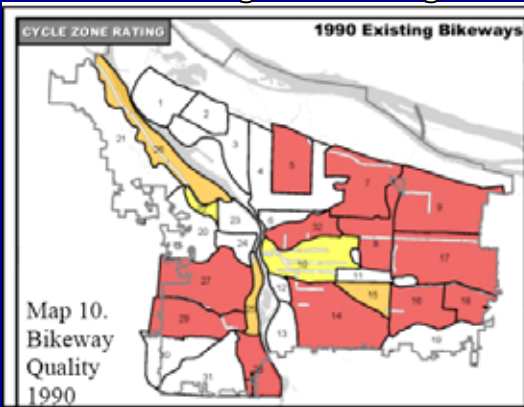
(i.e., validating efforts to improve cycling and/or “build it and they will come” approach)

Cycle Zones and Ridership 1990-2008

Bikeway Quality

Biking Conditions

Ridership



YR

1990

2000

2007

Lessons Learned

- Weighting the different conditions is critical
- There are nuanced factors that result in different considerations and treatments for each cycle zone
- This tool is only a companion to local knowledge and is simply a means to best organize and present local knowledge
- Like all models: data-intensive!
- The Bicycle Quality Index is transferable only when there exists a decent bikeway network

Next Steps

- **Develop a better interface between mapping tool (ArcMap) and analysis tool (Excel)**
- **Determine “correct” (universal?) weighting**
- **Develop more detailed proxy for trip distance**
- **Incorporate local streets and off-street paths**
- **Incorporate Bicycle Intersection Safety Index (BISI)**

4 Types of Transportation Cyclists

**Strong &
Fearless**



Interested but Concerned

No way No How

**Enthused &
Confident**



Increasing Bicycle Use

Cyclists
Per Day

Bikeway
Miles

15,000

12,500

10,000

7,500

5,000

2,500

0

— Bridge Bicycle Traffic

■ Bikeway Miles

1992:
83 miles of bikeways
2,850 daily trips

2007:
271 miles of bikeways
14,563 daily trips

350

300

250

200

150

100

50

0

Year:

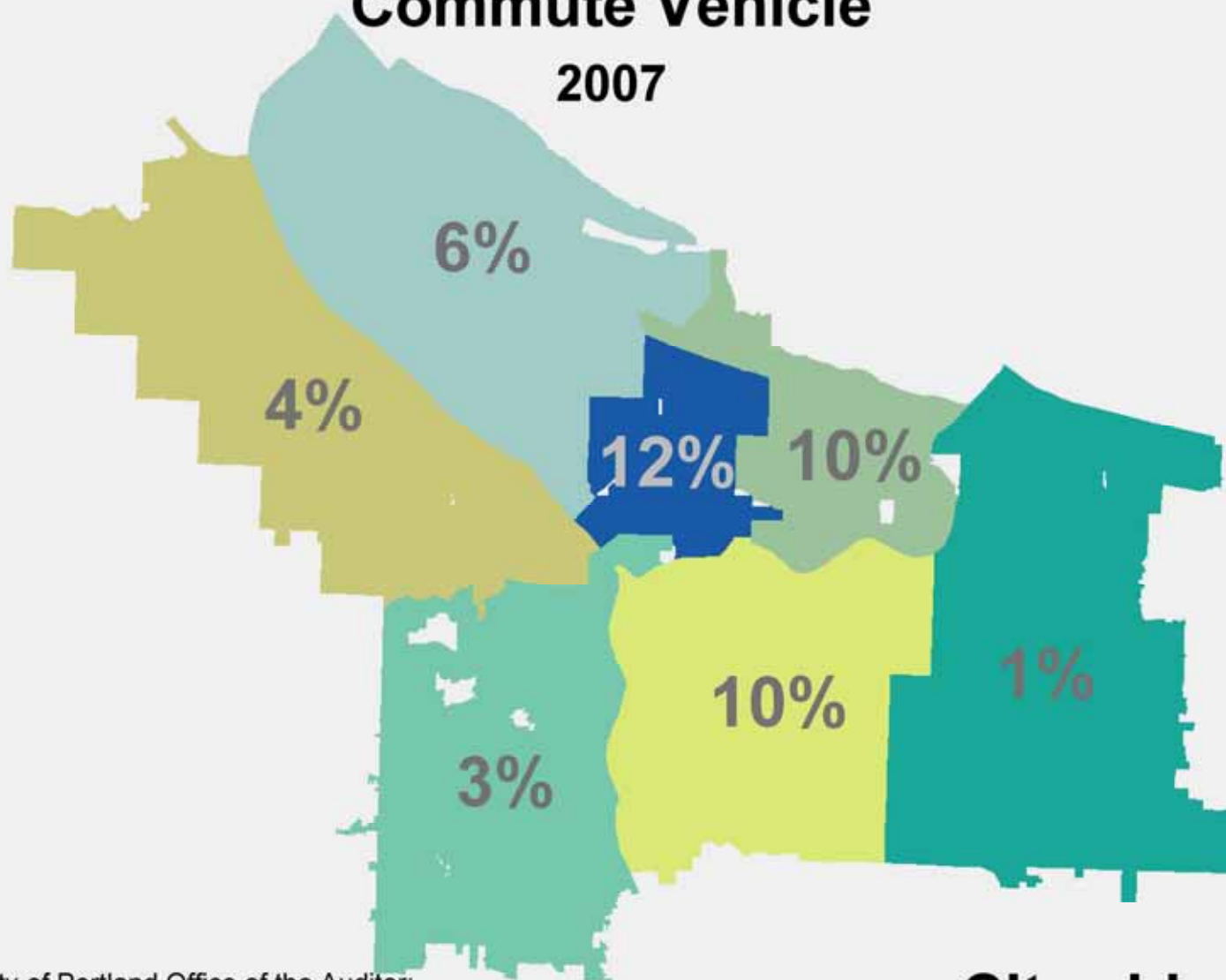
1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007

Bridge Bicycle Traffic 2,850 3,555 3,885 3,830 3,207 4,520 5,225 5,690 5,910 6,015 7,686 8,250 8,562 8,875 10,192 12,046 14,563

Bikeway Miles 78 84 86 103 113 144 166 183 213 222 235 252 254 260 262 263 266

People Reporting the Bicycle as their Primary Commute Vehicle

2007

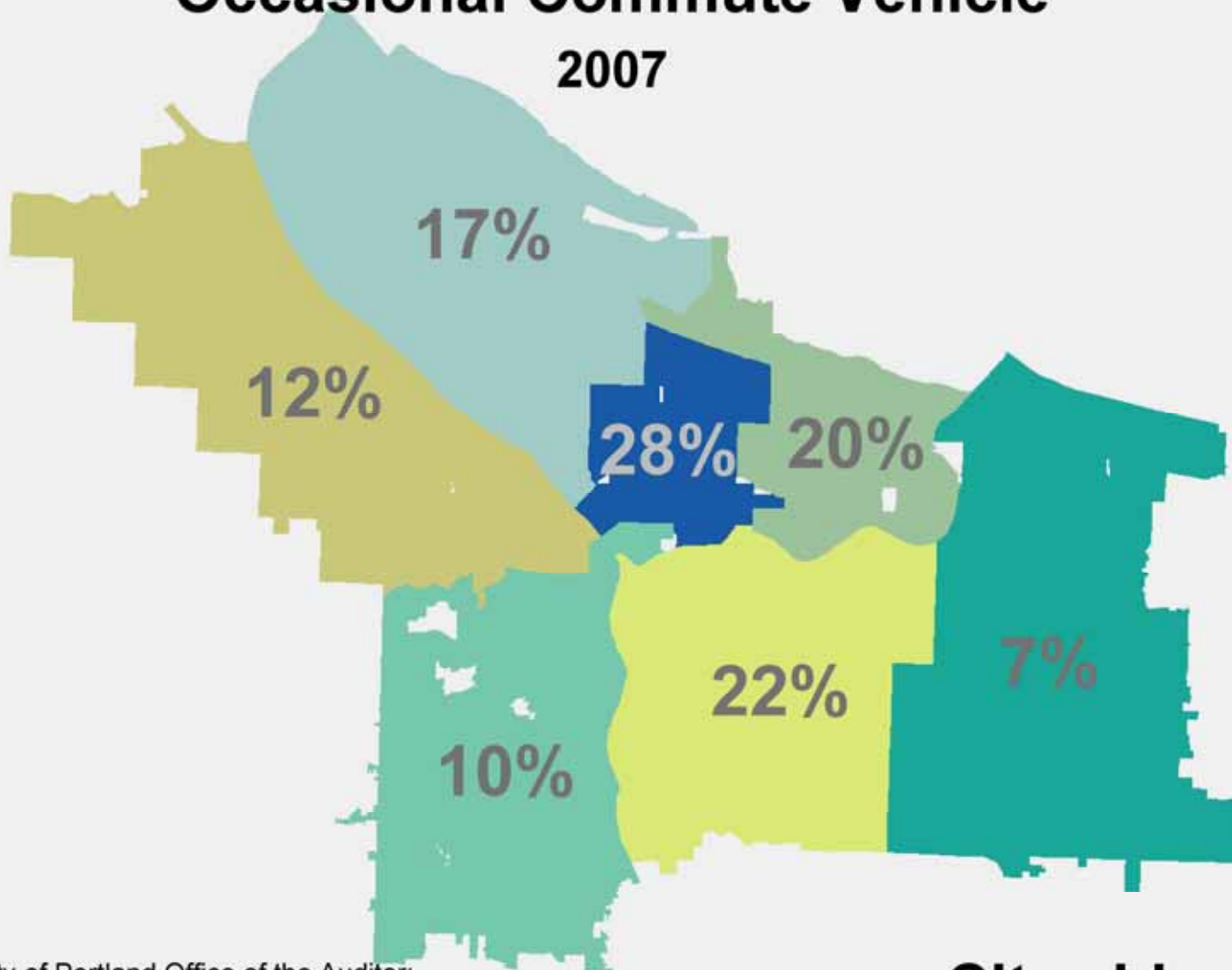


Source: City of Portland Office of the Auditor:
Service Efforts & Accomplishments Report 2006-07

Citywide: 6%

People Reporting the Bicycle as at least an Occasional Commute Vehicle

2007

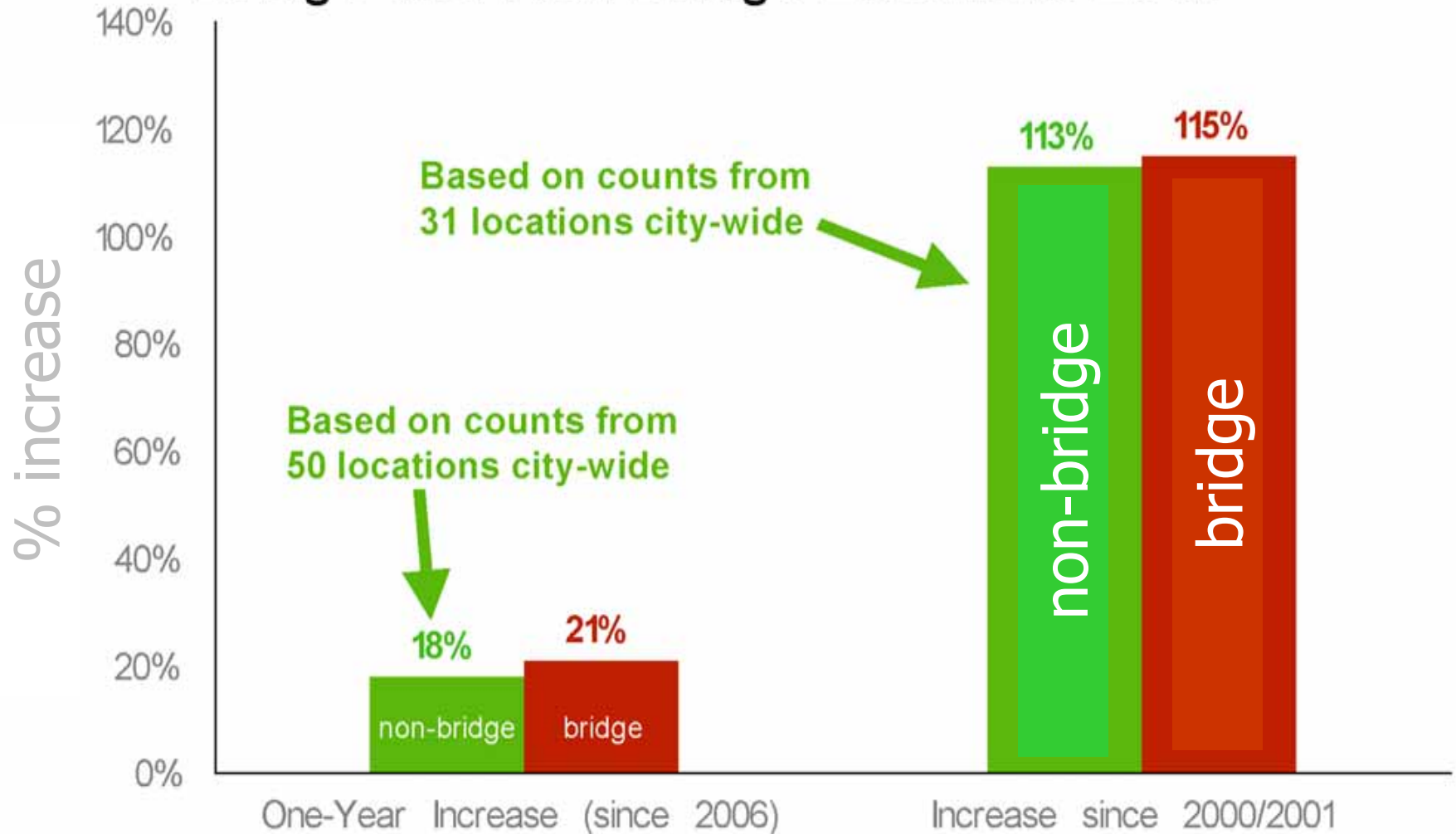


Source: City of Portland Office of the Auditor:
Service Efforts & Accomplishments Report 2006-07

Citywide: 16%

Increase in Bicycle Traffic

Bridge and Non-Bridge Locations 2007

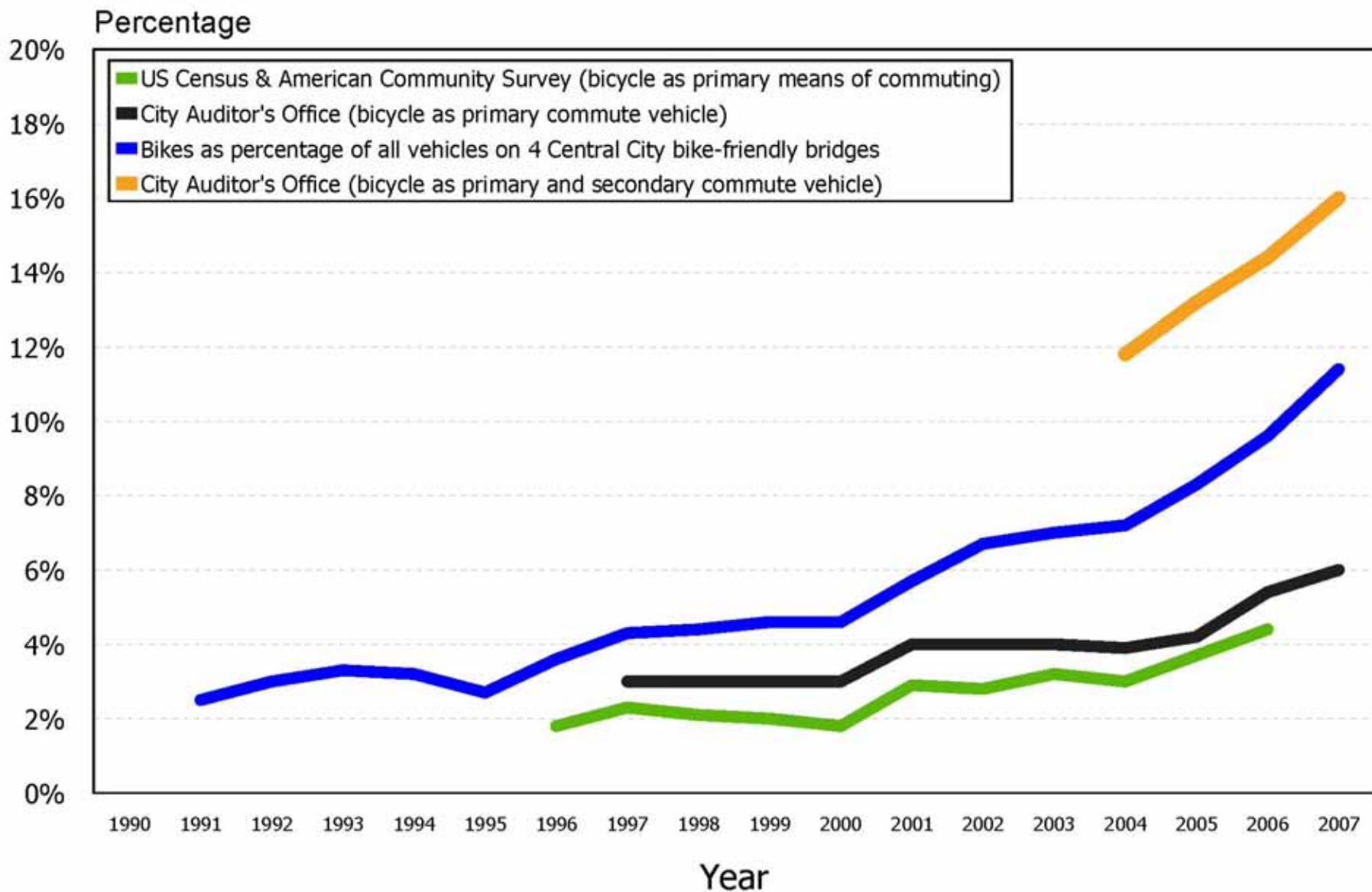


Based on manual and automated bicycle counts

■ Non-Bridge Locations
■ Bridges (Hawthorne, Burnside, Steel & Broadway)

Rising Bicycle Use in Portland

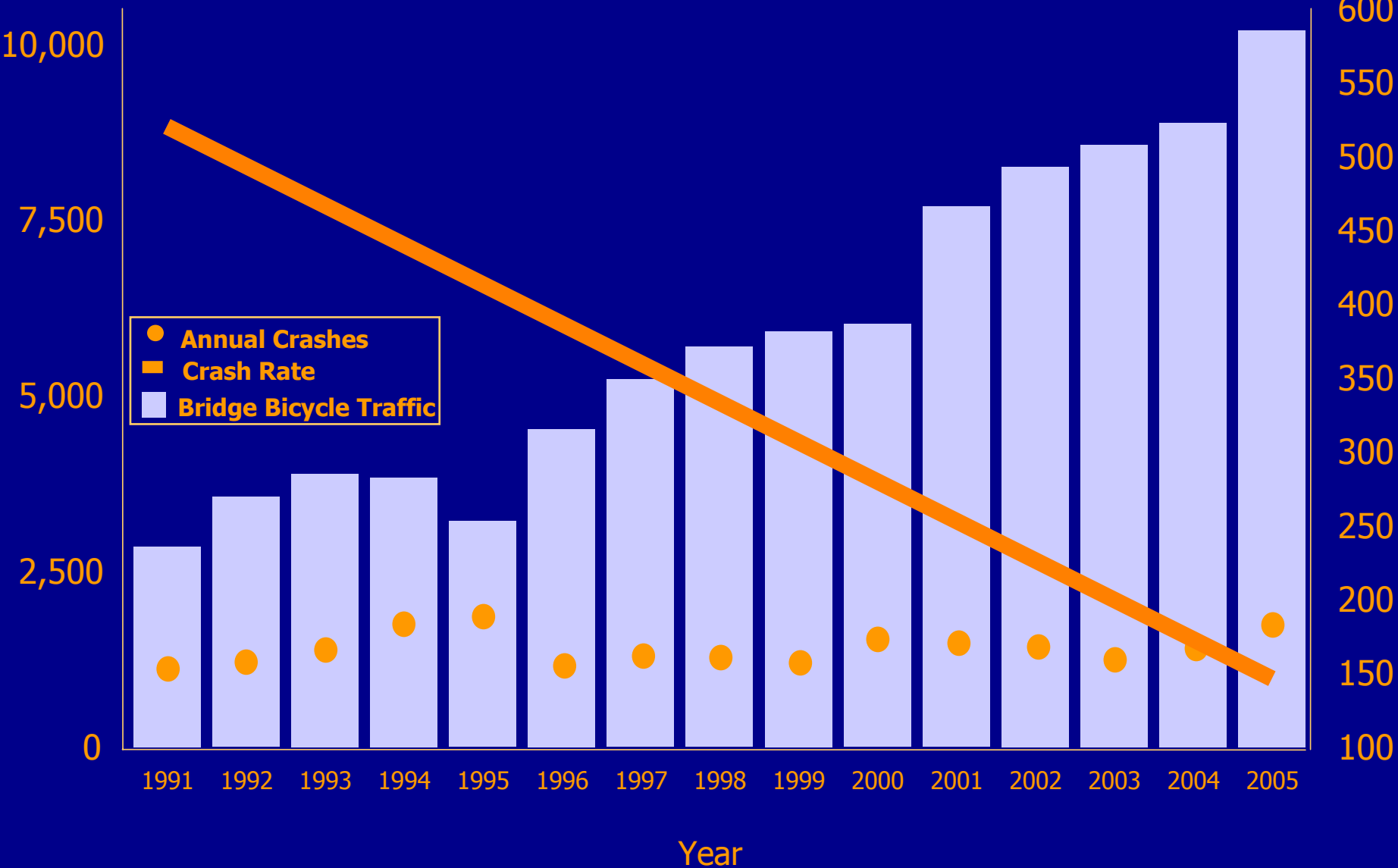
Bridge Counts, US Census, City Auditor's Reports



Decreasing Crash Rate

Daily Bicycle Trips

Crashes/Crash Rate



A map of a city, likely New York City, divided into several colored districts. The districts are: a large red district on the left; a green district in the top left; a blue district in the top center; a purple district in the center; a large blue district in the center-right; a green district on the right; a yellow district in the bottom left; a yellow district in the bottom center; and a yellow district in the bottom right. The text "Questions and Comments" is overlaid in the center of the map.

Questions and Comments