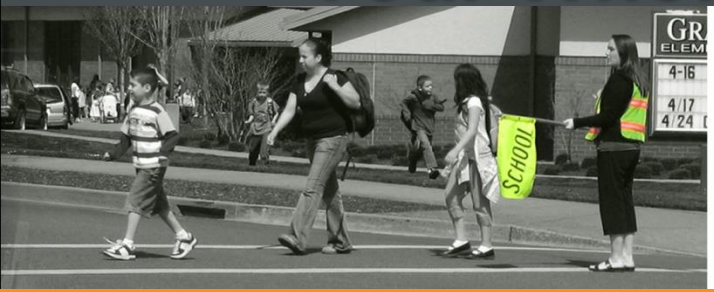
Transportation to Connect Your Whole Community



2019 Priest Lake Conference

American Planning Association
Washington Chapter
Inland Empire Section


SCHOOL
BUS STOP
AHEAD

Importance of Connectivity

Making Connections

Community Design Affects Walkability & Rideability

Meeting Mode-Share Targets / Reduced SOV Depends on Connectivity

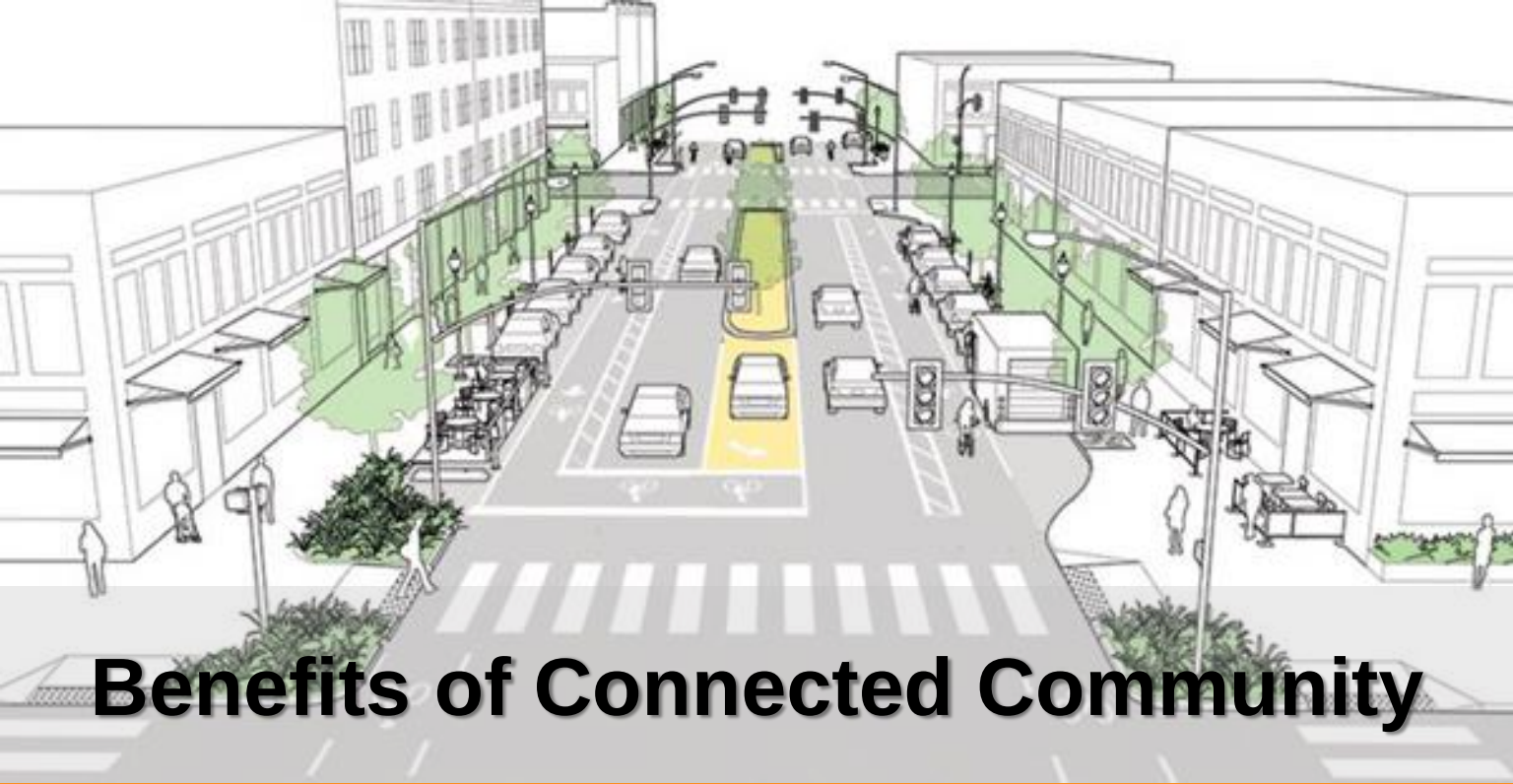
All Modes Benefit From Connectivity

Connectivity

- Tangible benefits of better connected communities.
- Effective policy and development guidelines that require high quality connectivity in new, private developments.
- Challenges crafting local plans that help redefine poorly connected neighborhoods.
- Structuring local transportation plans to emphasize equitable access and connectivity.

Learning Objectives

- Incorporating state policy that encourages connected community into your local plan
- Developing local policies that guide connected communities (Complete Streets, development code, mapping connectivity gaps, Safe Routes to School)
- Measuring multimodal network connectivity – national best practices
- Applying mapping techniques that effectively integrate principles of equity in local transportation plans



Benefits of Connected Community

Benefits of Improved Connectivity


Highly Connected

Central City block pattern


Well Connected

Inner neighborhood block pattern


Poorly Connected

Newer block patterns

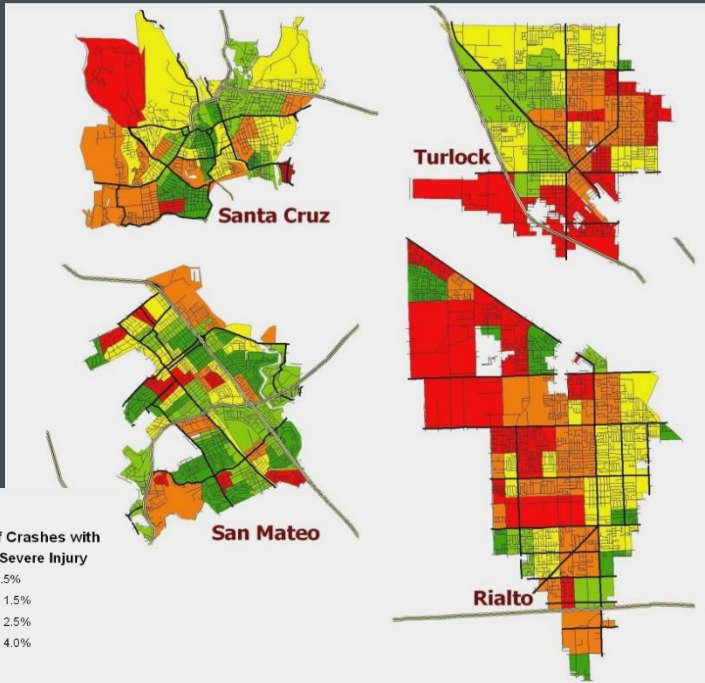
Well-connected neighborhoods tend to have…….

- Lower levels of vehicle travel and emissions per capita, and higher levels of walking, bicycling and transit use.
- Greater street route options with higher quality and more efficient emergency medical, fire and police response.
- With greater route options….lower average vehicle travel speeds and lower severity of vehicle, pedestrian and bicycle crashes.
- Increased access to recreational facilities and increased rates of physical activity (Active Transportation), with lower rates of obesity, heart disease and diabetes.
- Higher land values.

California Cities Study

Street network, Safety, Sustainability And Active Living in 24 medium sized California cities

Cities selected to represent a range of traffic safety level

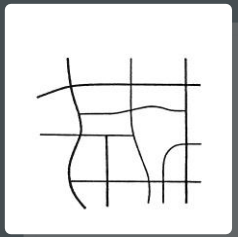


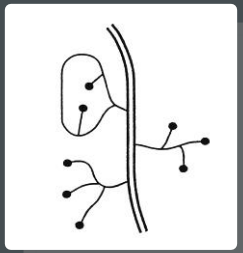
Source: Wesley Marshall and Norman Garrick

Better Travel Safety

Street network characteristics influence safety

- 24 California cities: safer and less safe
- Safer cities have reduced rates of severe and fatal crashes
- Safer cities have greater street and intersection density per sq mile
- Underlying factor may be lower vehicle speeds





Source: Street network types and road safety: A study of 24 California cities
Wesley Marshall and Norman Garrick, April 2010

Better Travel Safety

- **Better connected cities are safer**
- **Intersection Density (better measure) & Link-Node Ratio**
- **Both measures – difficult for people to understand intuitively**

Characteristic	**Safer Cities**	Less Safe Cities	Percent Difference
Average year of incorporation	1895	1932	
Average year of block development	1957	1972	
Population (2000 Census)	65,719	58,845	-8.9
Real intersection density (per sq mi)	**106.2**	62.7	**-41.0**
Average block size (acres)	**18.2**	34.5	89.6
Link to node ratio	**1.34**	1.29	**-3.7**
Fatal crashes	**3.1**	10.1	**225.8**
Fatal crashes not on limited access highways	2.3	8.6	**273.9**

Source: Wesley E. Marshall and Norman Glick, Street Network Types and Road Safety: A Study of 24 California Cities

Source: Wesley Marshall and Norman Garrick

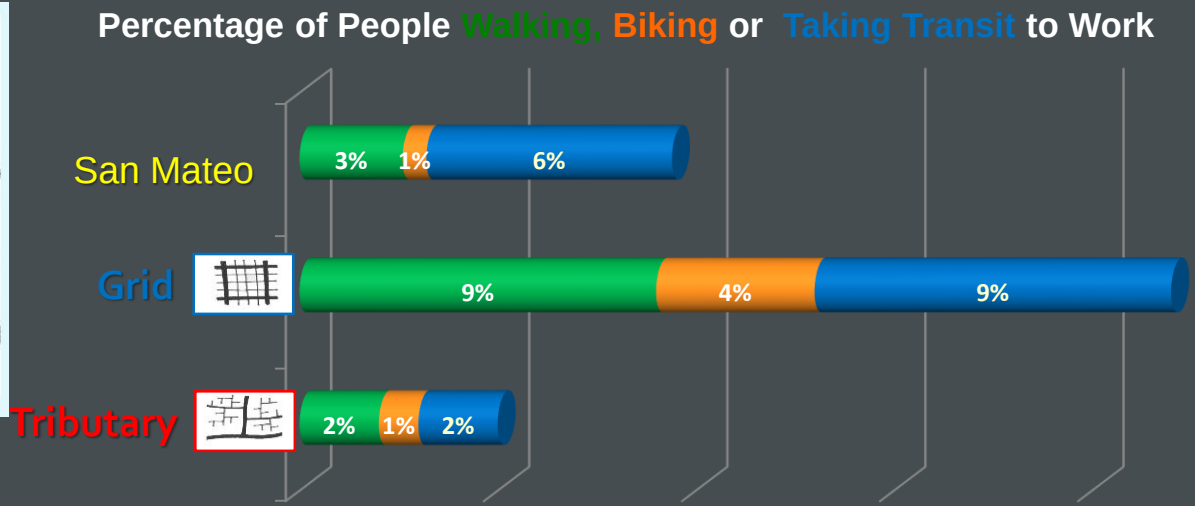
Higher Mode-Share

Street network patterns influence mode choice

- Street network patterns: connectivity and density
- Connected dense street networks have higher walk, bike and transit mode-share
- **Intersection density** associated with greatest increases rates of walking and biking
- Model indicated:
  Increased intersections from 81 to 324 per sq mile would lead
  Walk/Bike combined mode share increases from 3.2% to 7.8%

Source: *The Effect of Street Network Design on Walking and Biking*
Wesley Marshall and Norman Garrick, November 2009

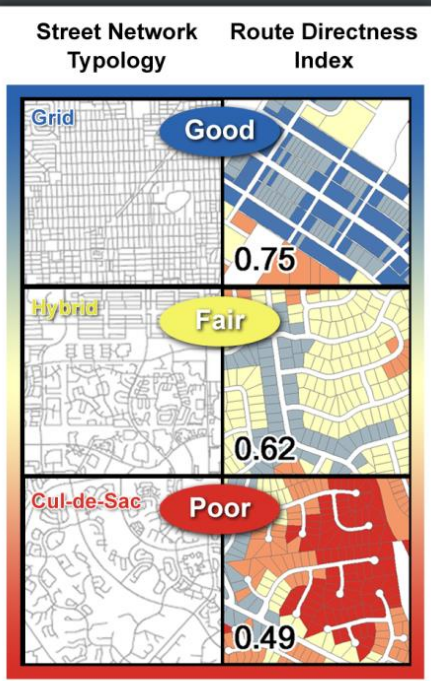
Connectivity & Mode-Share

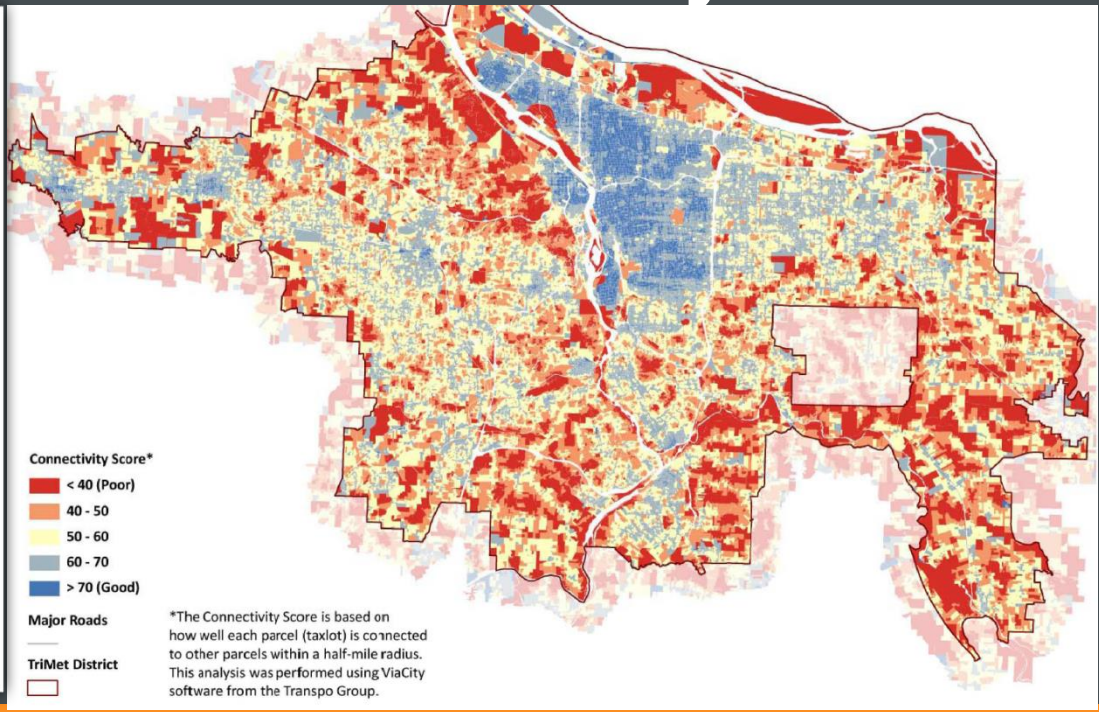


Better connected cities have higher walk and bike work trips

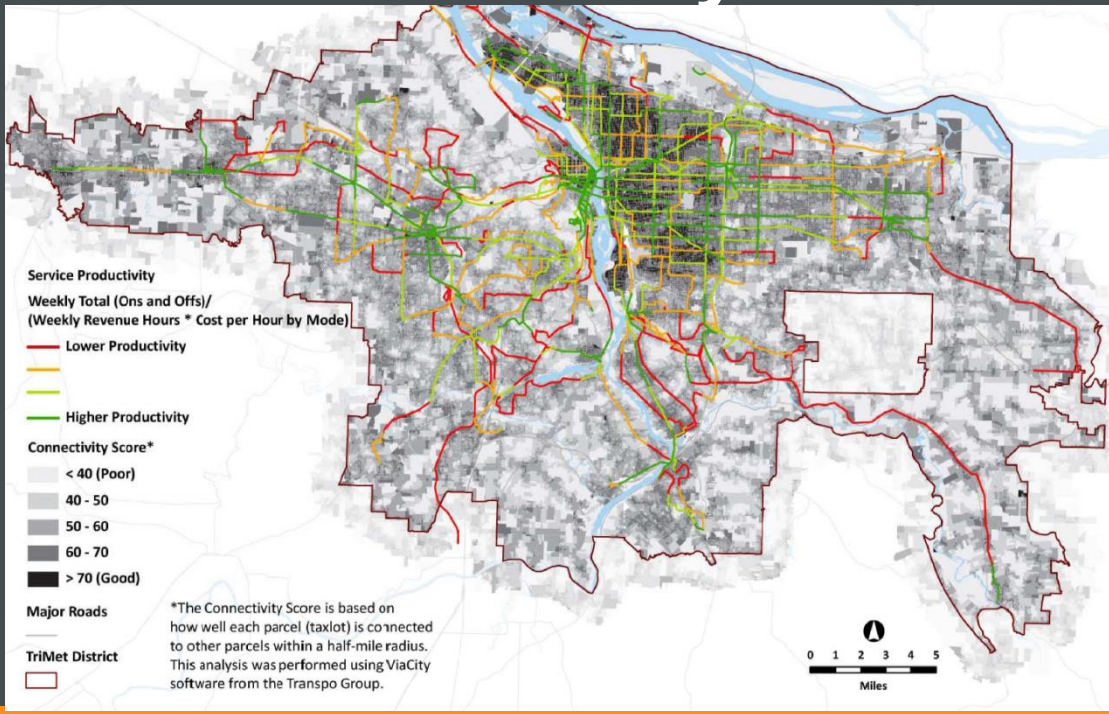
Source: Wesley Marshall and Norman Garrick

Transit Productivity

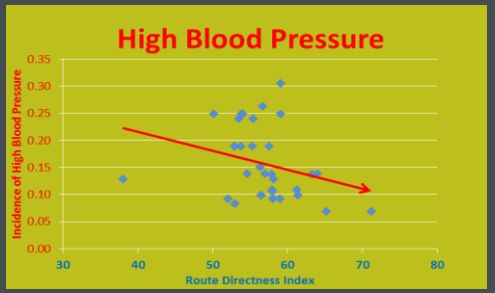


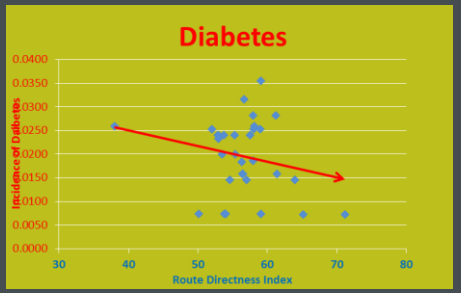


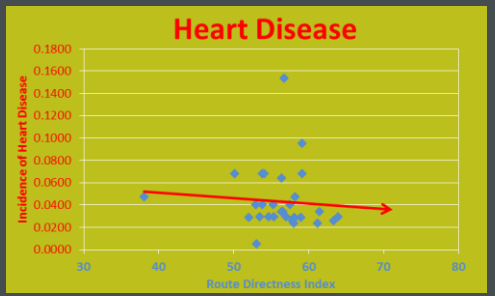
Transit Productivity

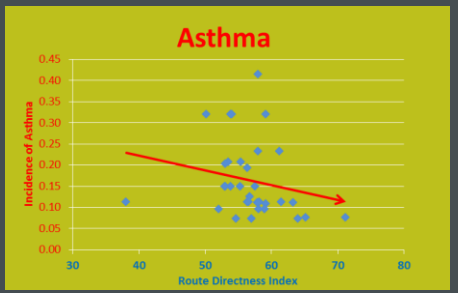


Greater Active Living









Source: Wesley Marshall and Norman Garrick | interim results

Policy Guide to Better Connectivity

Policy & Development Guide – New Dev

LEED v4 for NEIGHBORHOOD DEVELOPMENT

Updated July 2, 2018

Includes:
LEED ND: Plan
LEED ND: Built Project

LEED-ND

Neighborhood Pattern & Design – NPD

- Walkable Streets
- Compact Development
- Connected and Open Community

Intent

To promote projects that have high levels of internal connectivity and are well connected to the community. To encourage development within existing communities that promote transportation efficiency through multimodal transportation. To improve public health by encouraging daily physical activity.

Surrounding Connectivity - Locate the project such that the connectivity within ¼ mile (400 meters) of the project boundary is at least 90 intersections per square mile

Internal Connectivity - Design and build the project such that its internal connectivity is at least 140 intersections per square mile.

Block Length and Perimeter

Access and Connectivity

Vehicle, pedestrian, and bicycle access is addressed in Article 27, Access. Vehicle access requirements, specifically minimum distances between driveways and intersections, are established in Subsection 27.121(11)(c). Modifications t these requirements may be granted by the City Engineer. Joint access at a common property line is encouraged, and i some cases may be required (Subsection 27.121(11)(g).

Section 27.122 is dedicated to connectivity standards. Maximum block length and block perimeters are set in this cod section, as well as mid-block pedestrian and bicycle access way requirements for blocks over 600 feet long.

Section 27.330 establishes standards for Pedestrian Connector Routes. The development review body is authorized to require a pedestrian connection (access way) when a street connection is not provided, as well as in cases where "the route is necessary to continue existing or potential pedestrian or bicycle circulation routes, or to provide access to a special feature such as a school or transit station (Subsection 27.330(9))."

Block Length	
Local & Collector Streets	600 feet
Perimeter Block Length	
Local & Collector Streets	1,800 feet
Pedestrian / Bicycle Access Way	
Provided at Mid-block where block length is greater than	600 feet

Similarly, standards related to cul-de-sacs and dead-end streets in Subsections 27.122(3), 27.123(1), and 27.332(6) state that these type of streets shall be limited and an access way may be required to connect them to other transportation facilities.

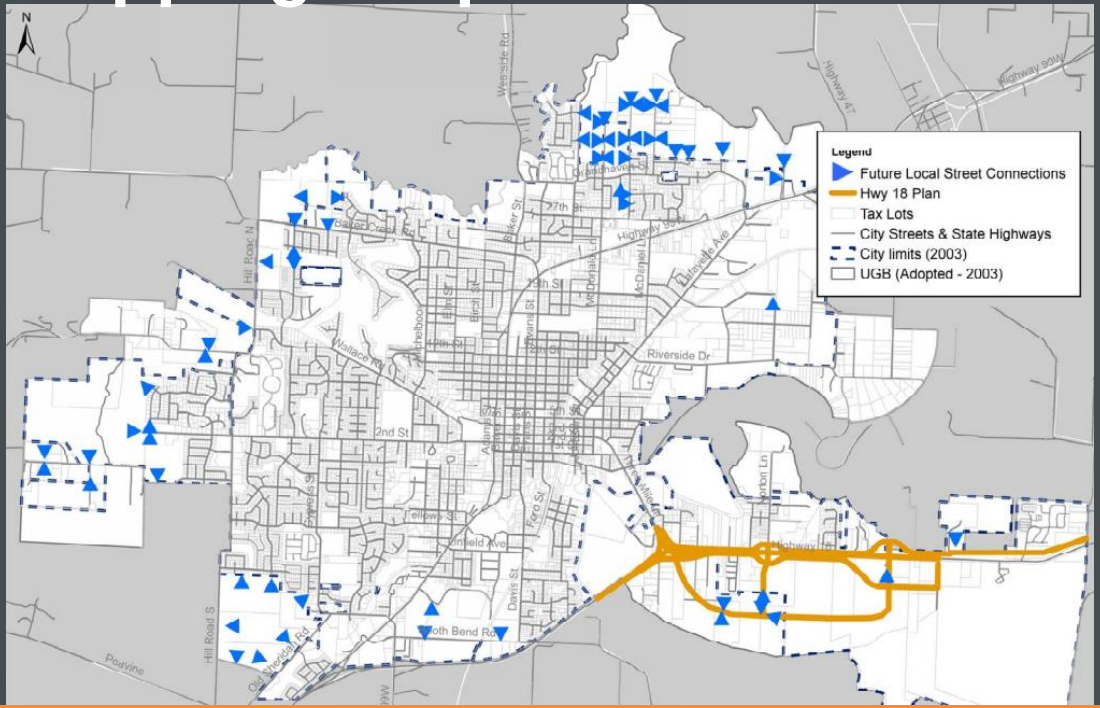
Example Complete Streets Policy

The safety and convenience of all users of the transportation system including pedestrians, bicyclists, transit users, freight, and motor vehicle drivers shall be accommodated and balanced in all types of transportation and development projects and through all phases of a project so that even the most vulnerable – children, elderly, and persons with disabilities – can travel safely within the public right of way.

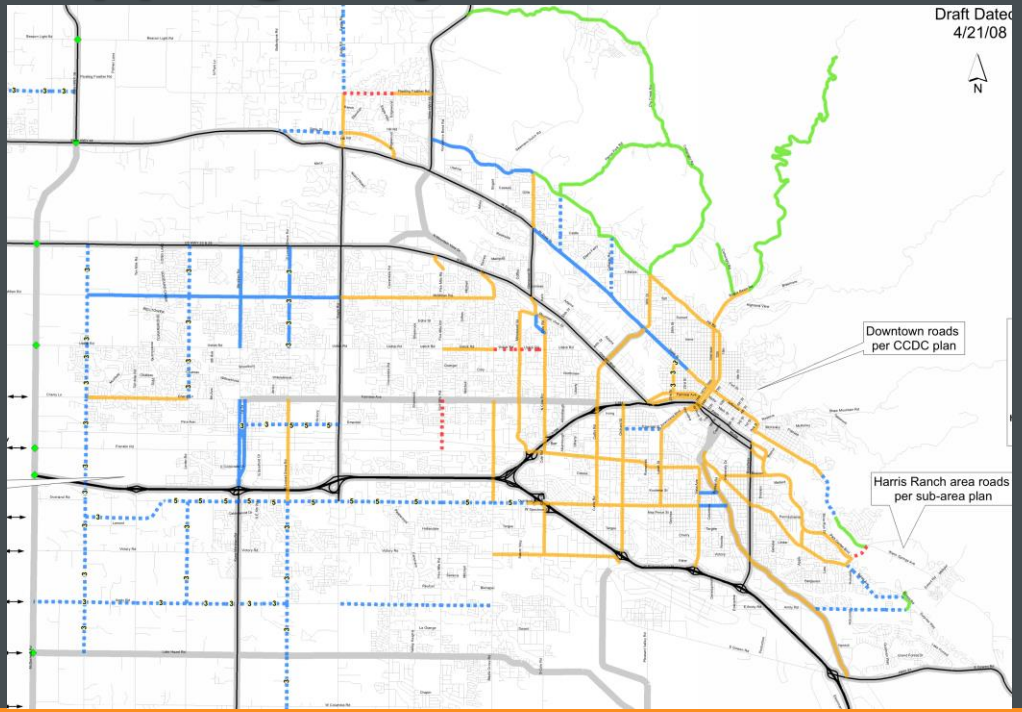
Examples of how the complete streets policy may be implemented:

- **Design and construct right-of-way improvements in compliance with ADA accessibility guidelines.**
- **Incorporate features that create a pedestrian friendly environment, such as**
  - **narrower traffic lanes**
  - **median refuges**
  - **curb extensions ("bulb-outs")**
  - **count-down pedestrian signals**
- **Improve pedestrian accommodation and safety at signalized intersections by:**
  - **using good geometric design to minimize crossing distances and increase visibility between pedestrians and motorists**
  - **timing signals to minimize pedestrian delay & conflicts**
  - **balancing competing needs of vehicular level of service and pedestrian safety (e.g., 2007 version of MUTCD to reduce design walking speed from 4 ft./sec. to 3.5 ft./sec.)**
- **Reclaim street space for other uses through the use of "road diets" (e.g., convert four-lane roadway to three-lane roadway with marked bike lanes)**

Mapping Required Connectors



Mapping Major Streets Plan



Legend

- Future Interchanges
- Other ACHD Streets

Type

- Built (Street Footprint Fixed)
- Built Soon
- Plan/Policy (Adopted)
- Plan/Policy (Unofficial)
- Environmental

Mobility Roadways

- Mobility Arterials*
- State Mobility Highways**

*Mobility Arterials are typically ACHD Principal Arterials but not all Principal Arterials are Mobility Arterials (e.g. State Street, east of Glenwood). All arterials provide a mobility function, but the Mobility Arterial is to provide a higher speed and through-put function than other arterials; possibly with as many as seven (7) potential future travel lanes.

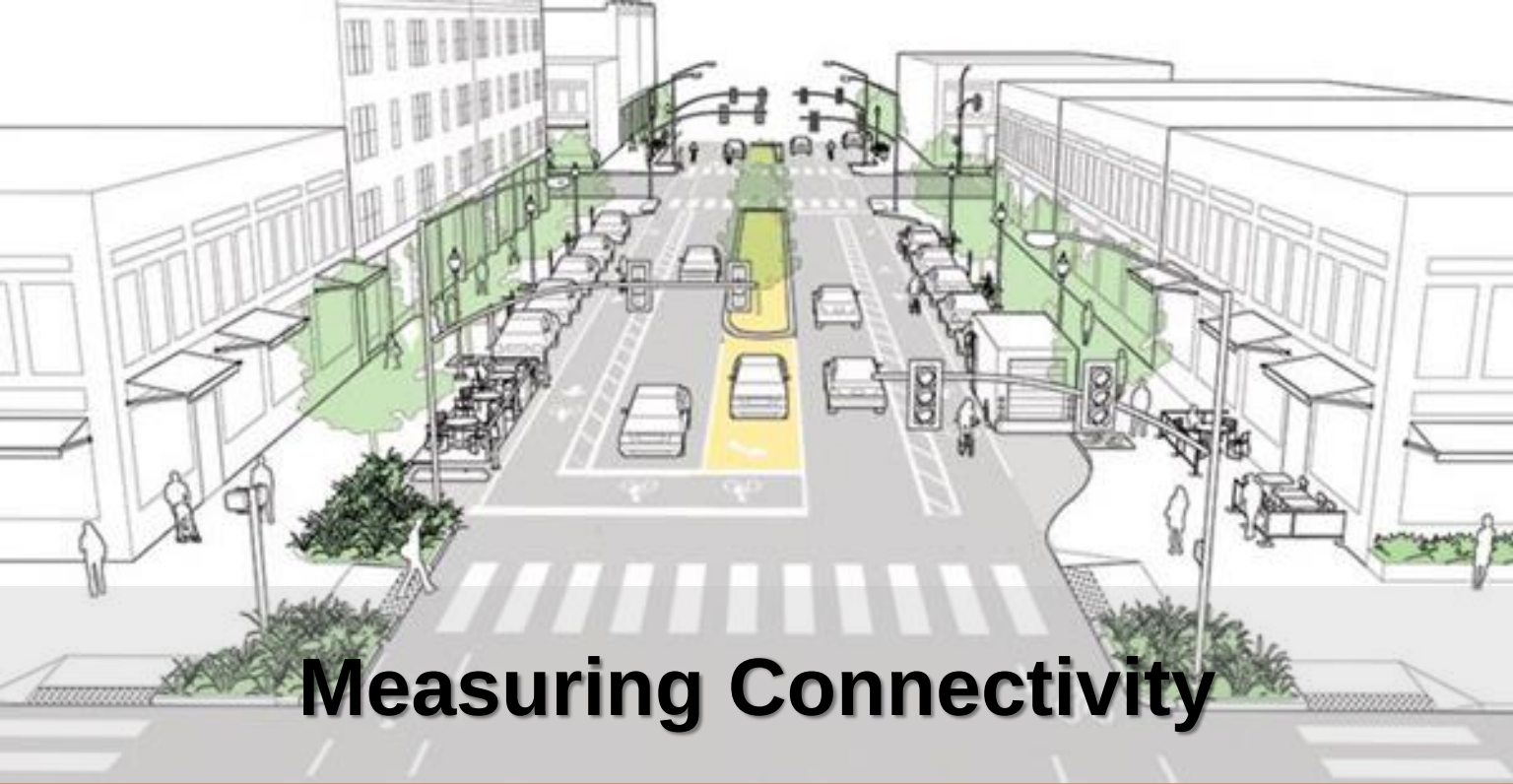
**State Mobility Highways are to provide higher speeds, higher capacities, with greater access control, to achieve a greater inter-city through-put function; multi-lane expressways and freeways included.

Concurrency Refinement Planning

- Refine Non-Motorized Plans to Include Priority Bike and Ped System Improvements, Including Pedestrian Crossing and Neighborhood Connector Projects as Concurrency Mitigation

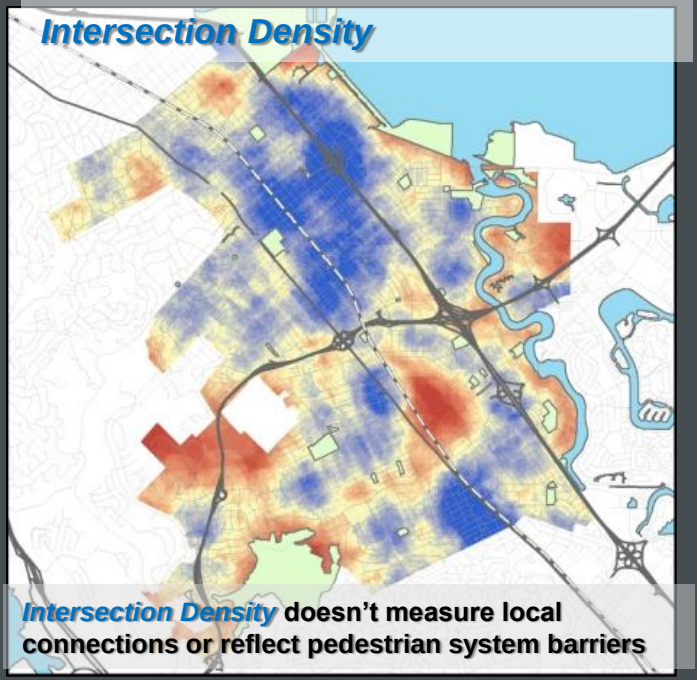
- Integrate Street and Non-Motorized Connectivity Indices with Percent Complete Measures as Thresholds for Non-Motorized Person-Trip Credits

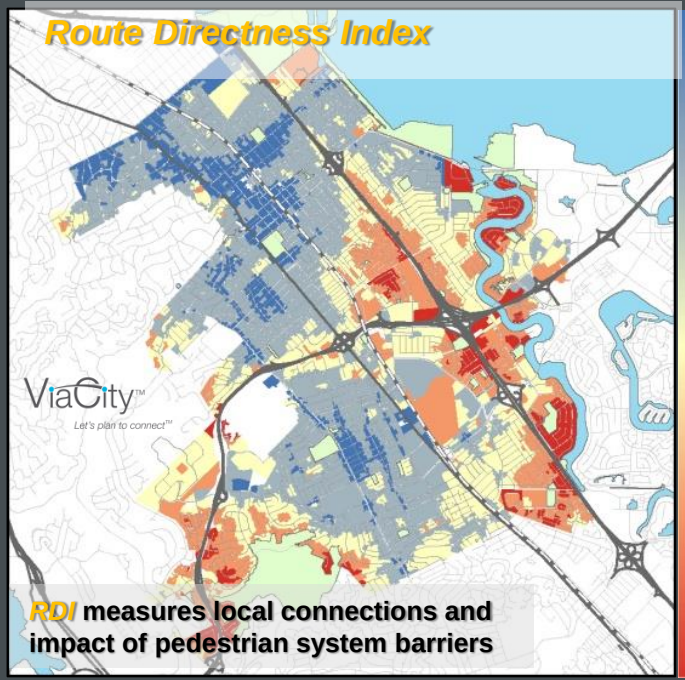
- Consider TDM and Transit Capital Projects for Concurrency Mitigation



Measuring Connectivity

Comparing Connectivity Metrics



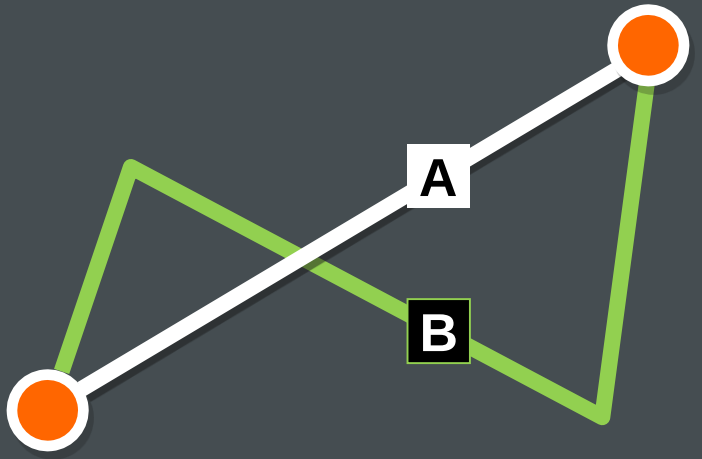


What is Route Directness Index?

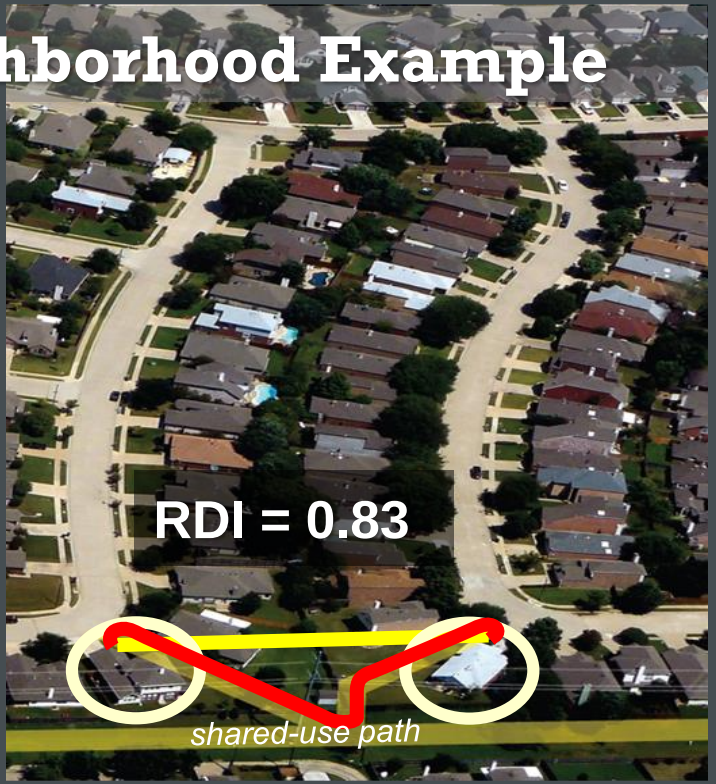
straight-line distance “A”

actual route distance “B”

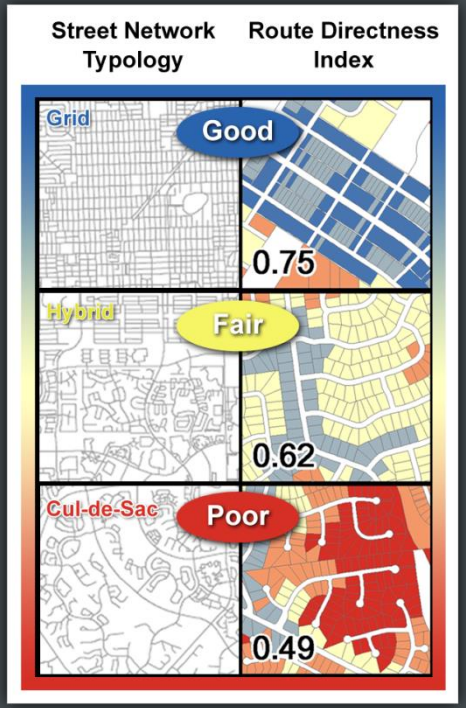
RDI = A / B

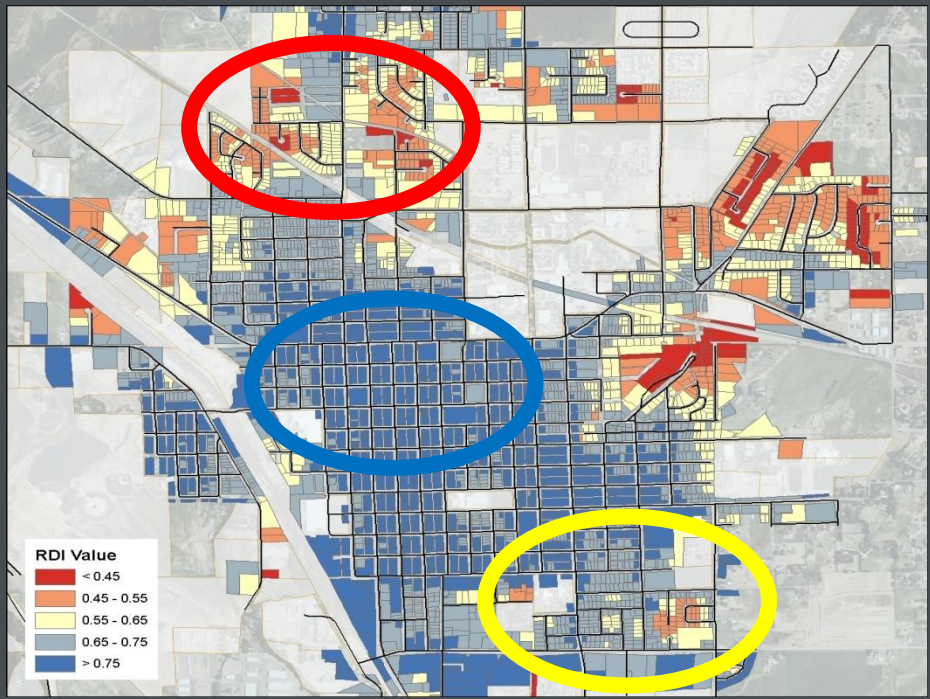


RDI Applied - Neighborhood Example

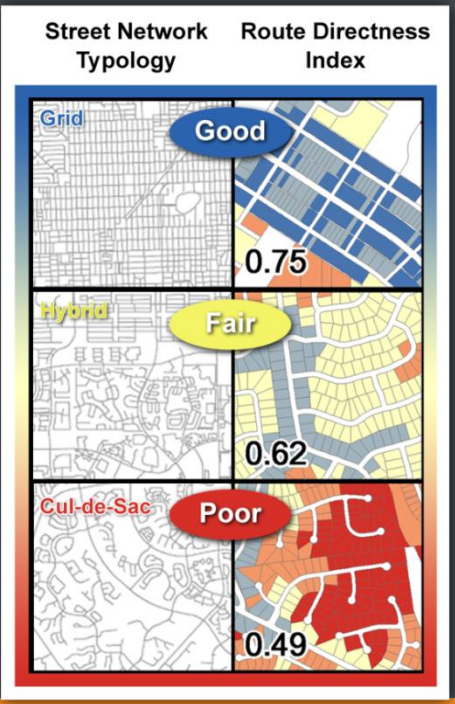


Sample City: Variation in RDI

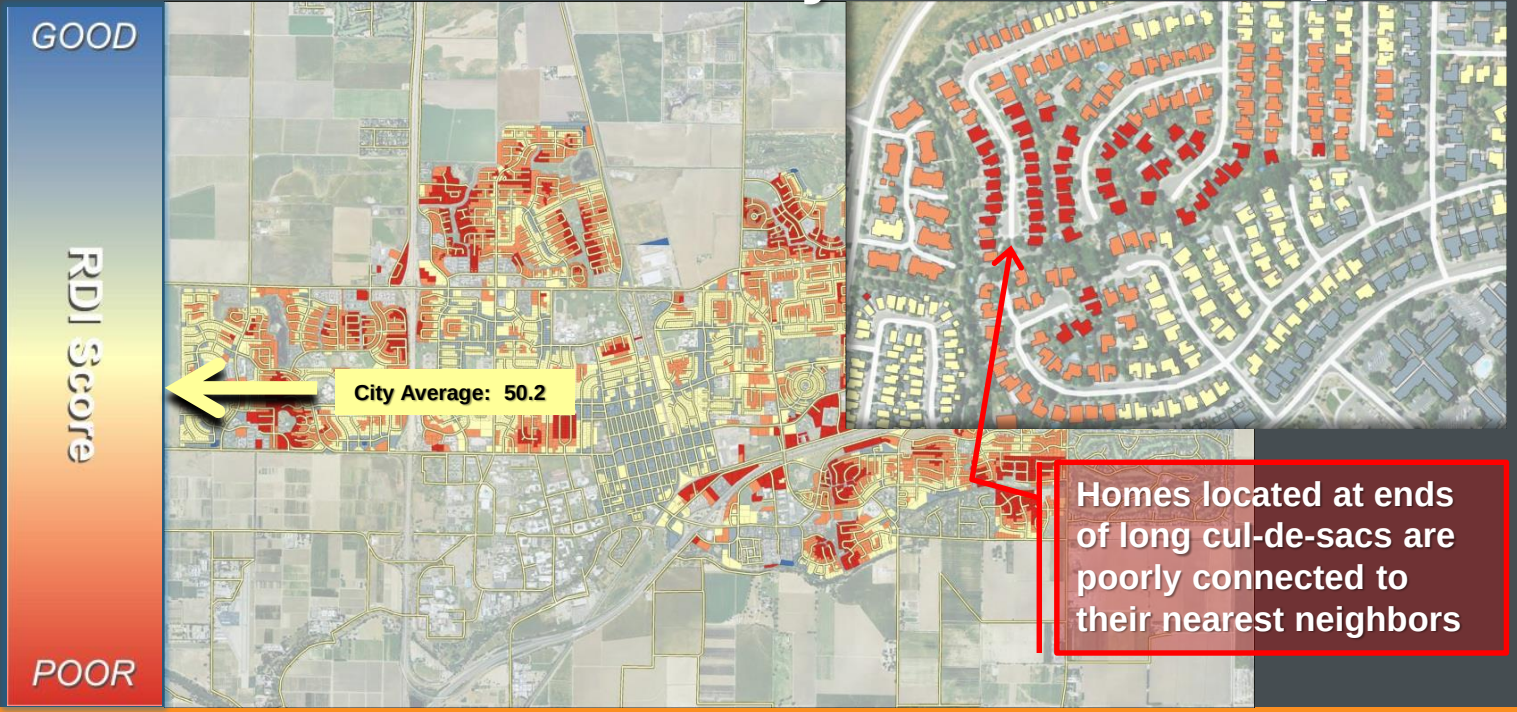




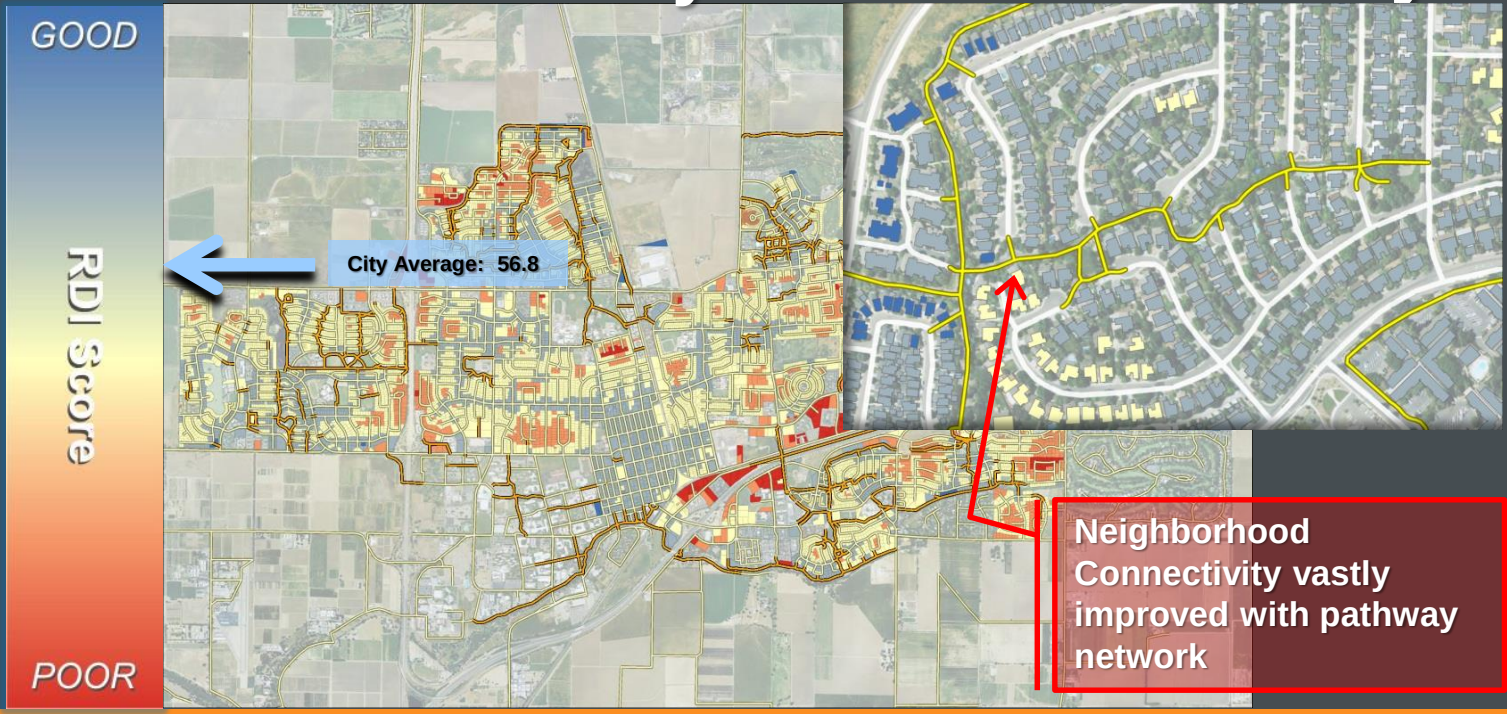
Davis, California



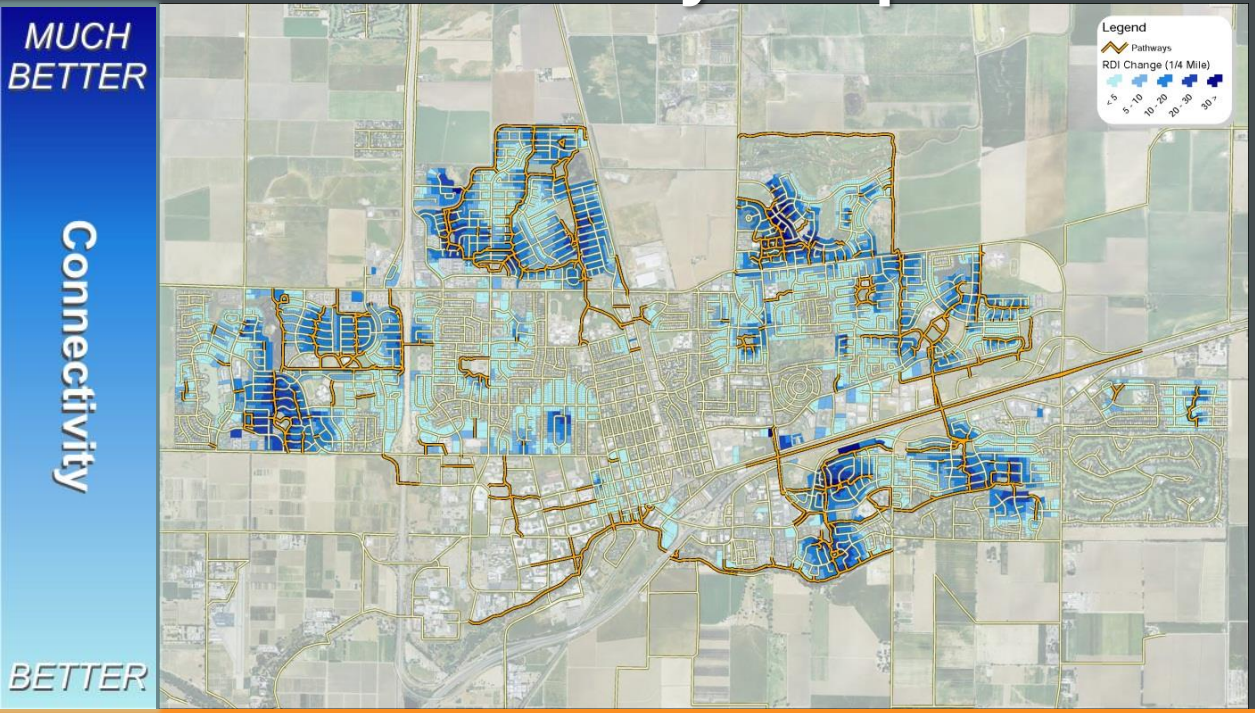
Davis Connectivity: Streets Only



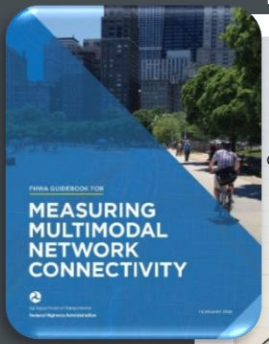
Davis Connectivity: Streets & Pathways

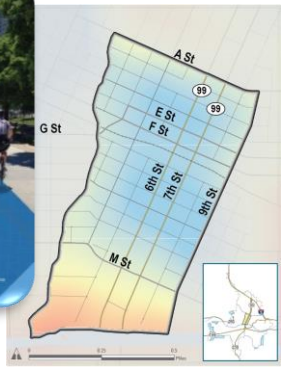


Davis Connectivity: Impact of Pathways

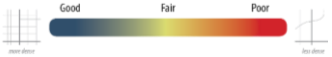


Pedestrian Connectivity Analysis

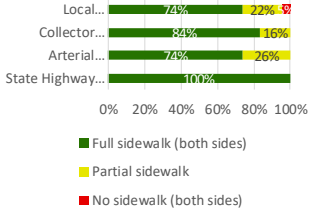


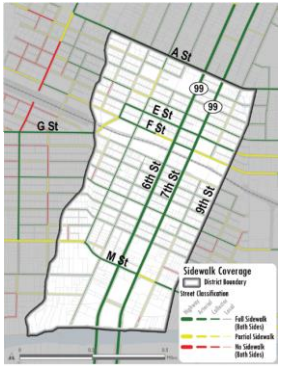


Intersection Density

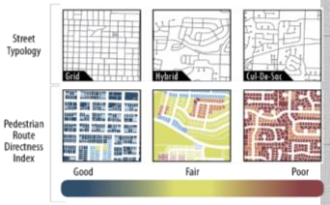


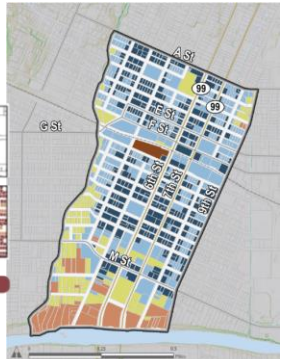
Network Completeness

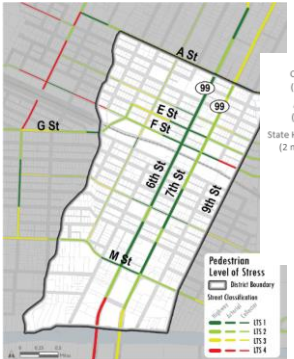




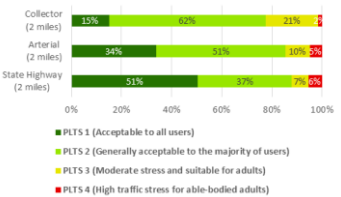
Route Directness



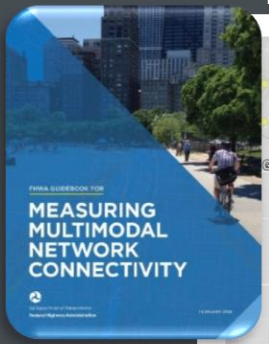




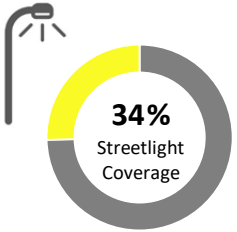
Level of Traffic Stress

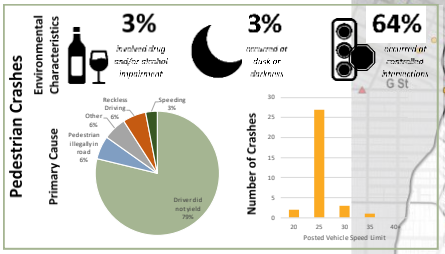


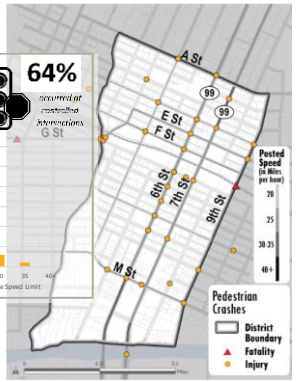
Pedestrian Connectivity Analysis



Lighting Coverage

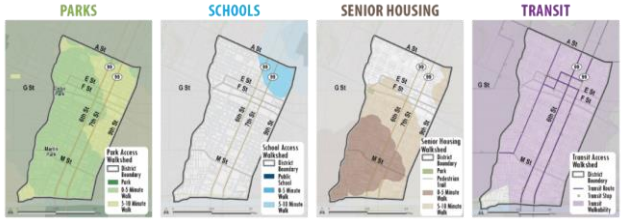






Safety

Access



Key Findings

+ Improve pedestrian visibility along 6th Street and 7th Street
+ Enhance G St/3rd St pedestrian crossings and traffic control
+ Consider development code revision - require additional east-west street grid connections near the Rogue River
+ Prioritizing new sidewalks with appropriate buffering and new street lighting along:

Pedestrian Connectivity Analysis

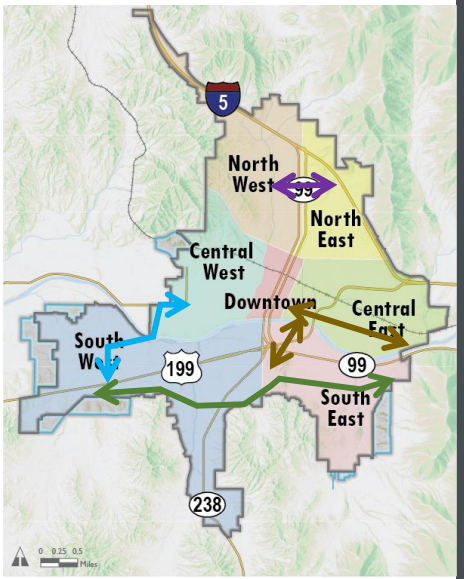
+ Priority sidewalk, additional buffering and street lighting improvements (city-wide)

+ Refining the land development code to require additional east-west street grid connections near the I-5 Exit 58 interchange if/when re-developed (NW & NE)

+ Evaluate/identify east-west street corridor with pedestrian pathway/cycle track connection between eastern city boundary and central city (with cross-river links to Baker Park)

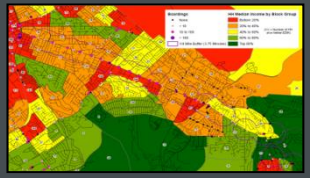
+ Evaluate/identify new, east-west street corridor options with pedestrian pathway/cycle track connection between the western and eastern city boundaries, south of US 199 and OR 99

+ Evaluate/identify new non-motorized bridge connection to southwest neihgborhoods



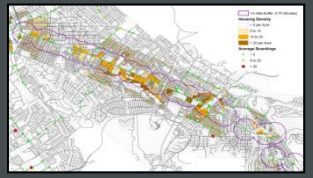
Priority Bus Stop Connectivity

Potential Ridership



HH Income (Low)

×



Housing Density

Built Environment

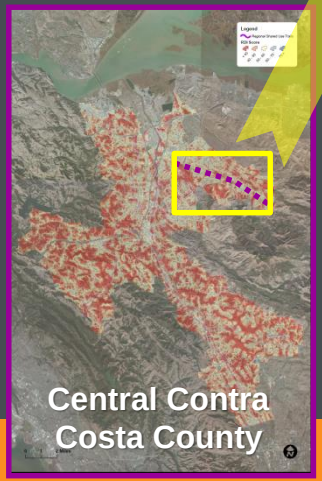
+

Measured Walk Connectivity (Poor)

+

Ped-Bike Crash History

(re-assigned summary by individual bus stop)



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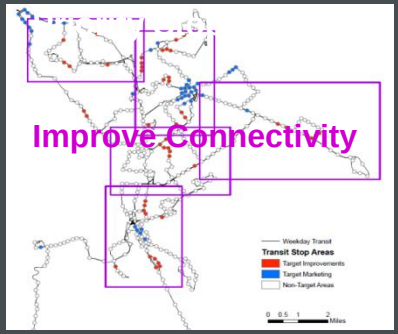
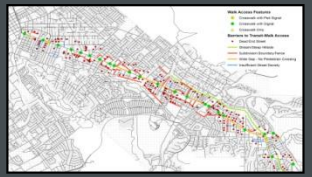


Next Step:

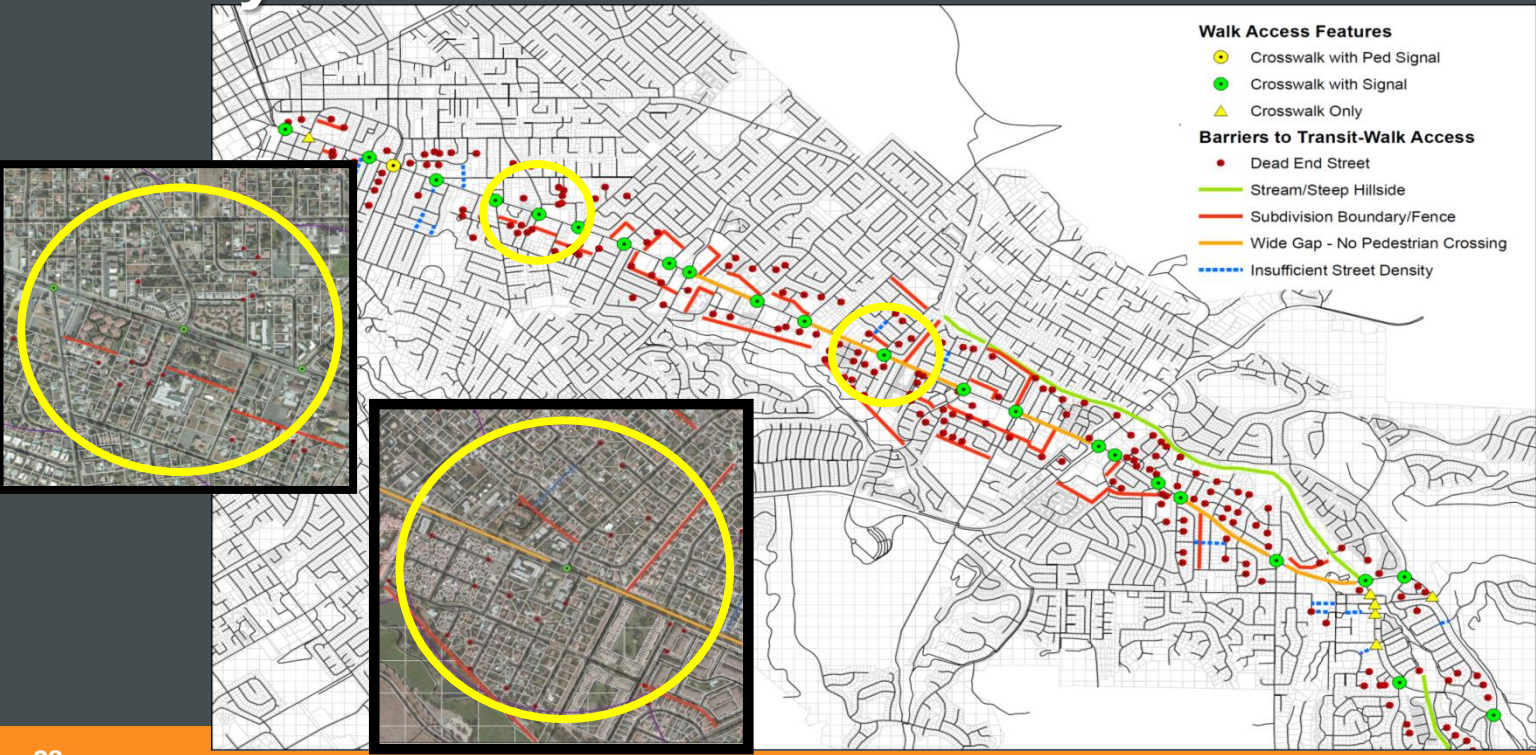
Local Pedestrian Plan Refinement and Implementation

Walk-Transit Barriers



- ✓ Sidewalk Coverage/Inventory
- ✓ ADA Transition Plan

Identify Walk Barriers



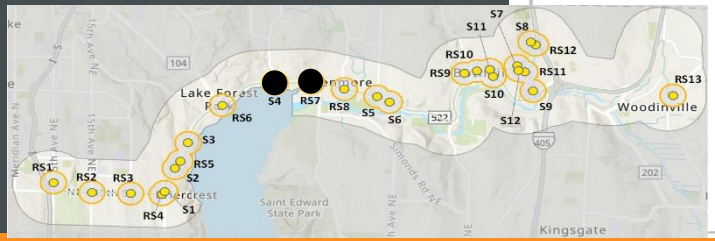
Transit Station Connectivity

Non-Motorized Access

Connectivity

Historic commercial strip development north of SR 522 and a limited set of north-south street crossings of the highway serve to limit connectivity to the proposed RS7 station.

Historic commercial strip development north of SR 522 and a limited set of north-south street crossings of the highway serve to limit connectivity to the proposed S4 station.



Access to Transit

Sidewalk Coverage

SR 522 and 61st Avenue NE are generally fitted with continuous sidewalks serving proposed stations S4.

There are missing sidewalks on SR 522 (south) and along 67th Avenue NE within the RS7 station area.

Station Accessibility

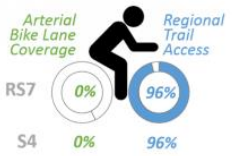
Nearly all pedestrian accessibility features are present at the crossing of SR 522 at the 61st Avenue NE signal.

Proposed station RS7 is not located at an existing traffic signal and therefore lacks all highway crossing accessibility features. The nearest signal is located at 68th Avenue NE.

Bicycle Routes

The Burke-Gilman Trail is located immediately south of SR 522 and provides connection to either planned BRT stations RS7 and S4.

Consider on-street bike lanes on 67th Avenue NE (RS7) or 61st Avenue NE (S4).



Emphasizing Equity

Equity in Transportation Planning

A fair or equitable distribution of transportation benefits and cost…..

Social/Environmental Justice

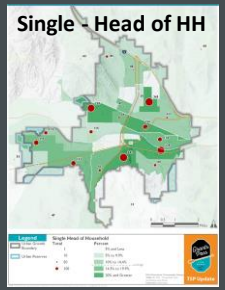
- Housing affordability
- Impacts on low-income communities
- Fare structures
- Access to employment
- Public transportation service quality in lower income communities

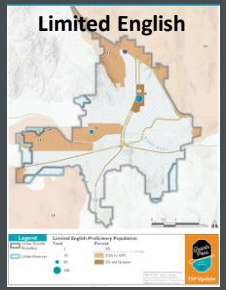
Mobility Need And Ability

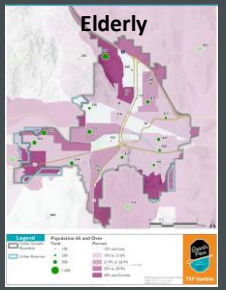
- Universal design
- Special mobility services
- Disabled parking
- Service quality for non-drivers

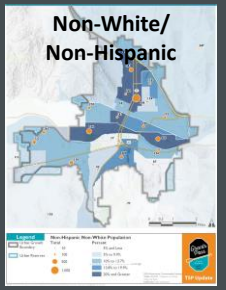
Equity – Mapping Vulnerable Populations

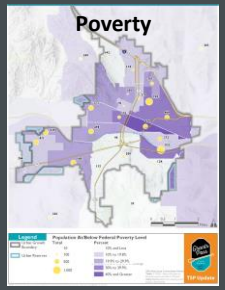
This?

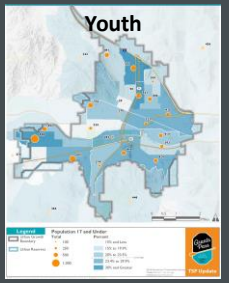




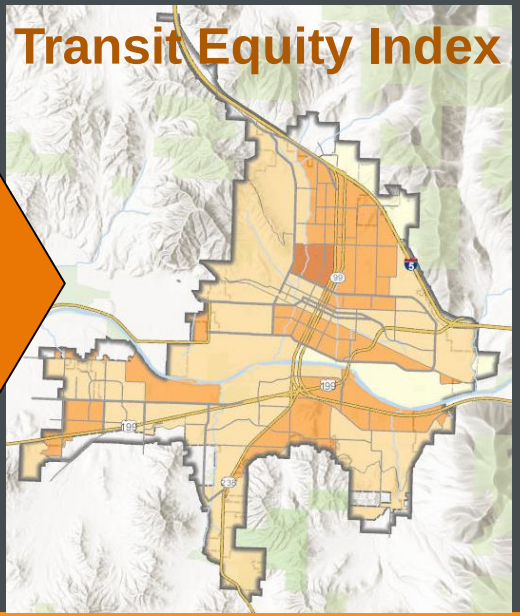








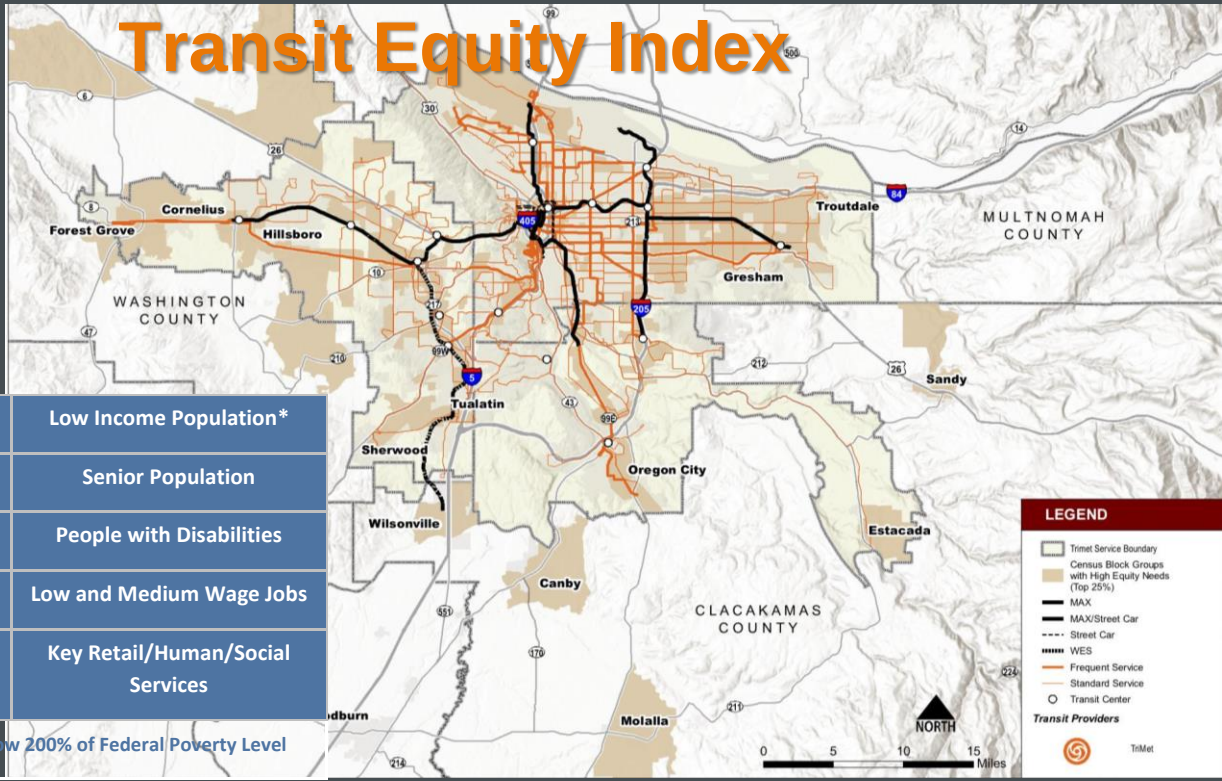
Or This?



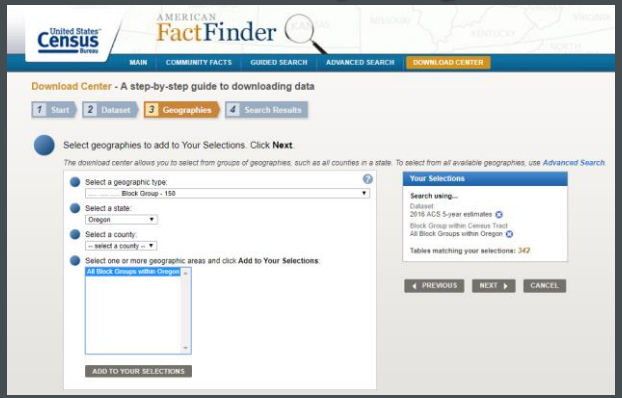
Transit Equity Index

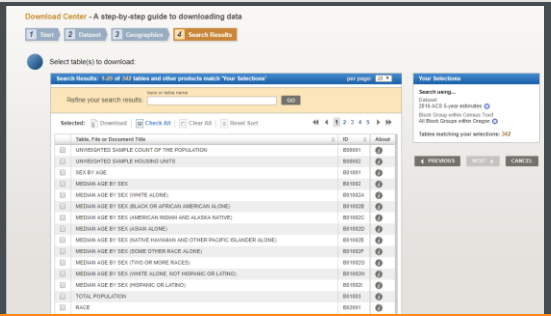
People of Color	Low Income Population*
Limited English Proficiency	Senior Population
Youth Population	People with Disabilities
Limited Vehicle Access	Low and Medium Wage Jobs
Affordable Housing Units	Key Retail/Human/Social Services

* Persons Reporting Income Below 200% of Federal Poverty Level



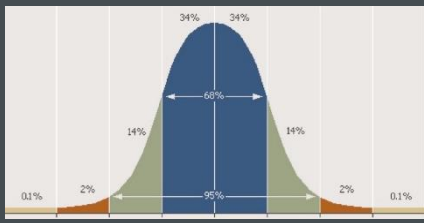
Transit Equity – ACS-Based Data





1. Relevant ACS data is complied in Excel for the entire state or region (at the block group level)
2. Simple data organization and calculations - <u>one time</u> in Excel
3. Excel sheets are input into GIS Model and scored automatically for user-specified areas (e.g., State, County, City, District)

GIS Model will normalize ACS data for the given area and assign scores of 0-4 for each index component, for each block group according to the chart at right

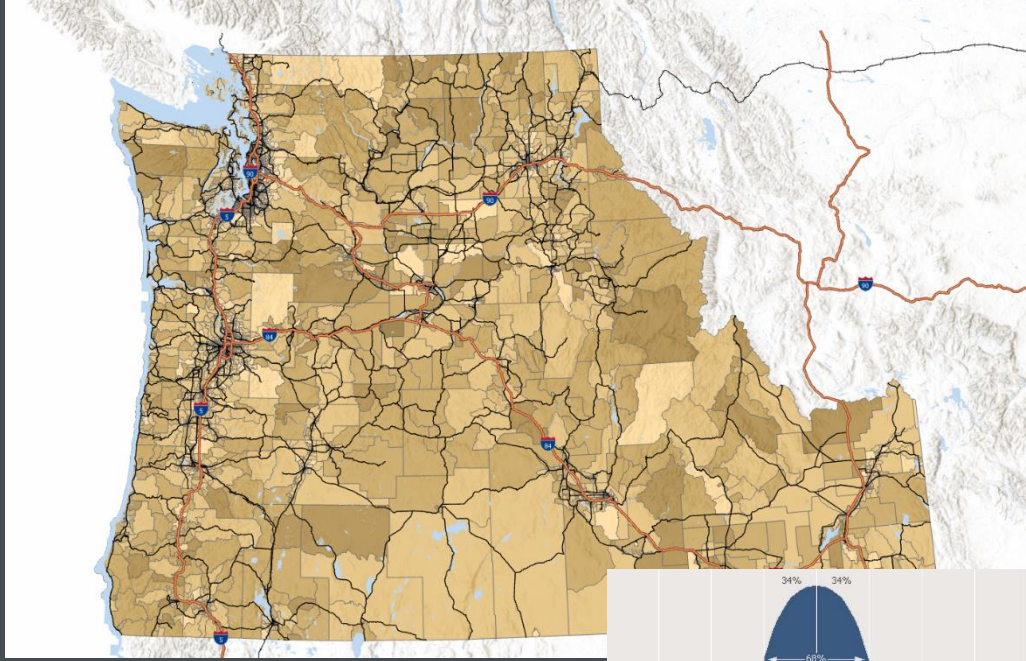


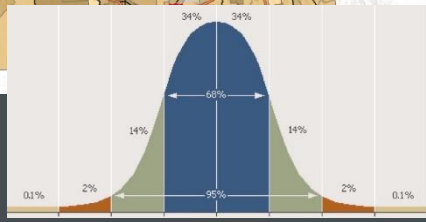
Region

A Transit Equity Index scoring regimen should include measures of Low Income Populations summarized by individual Census block groups. Five or perhaps more factors can be normalized, scored and integrated into the Index to describe and identify locations of high concentrations of Low-Income Populations for the region.

Low Income Population*	Senior Population
Youth Population	People with Disabilities
Limited Vehicle Access	

* Persons Reporting Income Below 200% of Federal Poverty Level

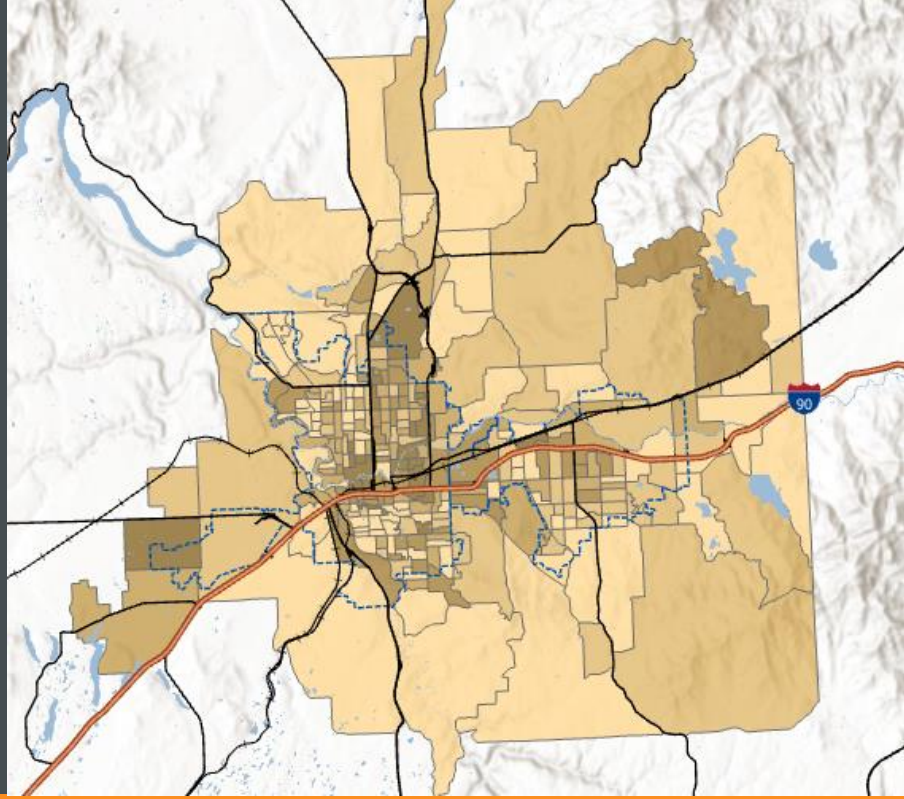




U.S. Census; American Community Survey: 2012-2016

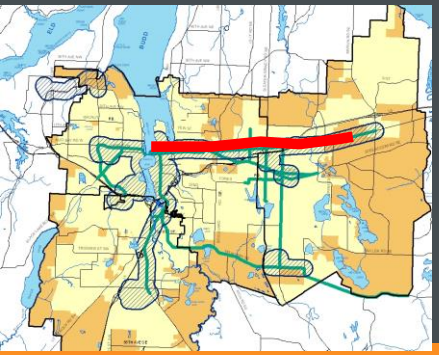
Std. Dev. from mean	-3	-2	-1	0	1	2	3
Equity Score				0	1	2	3	4

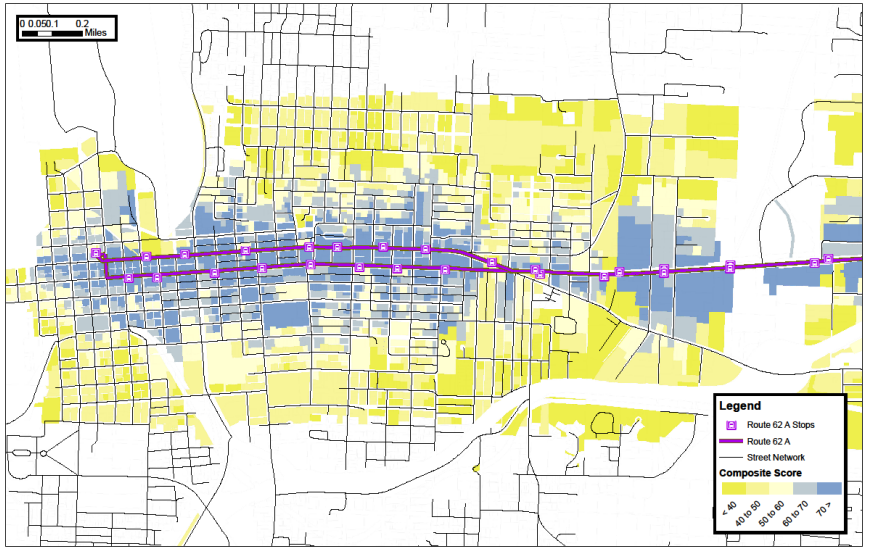
Spokane



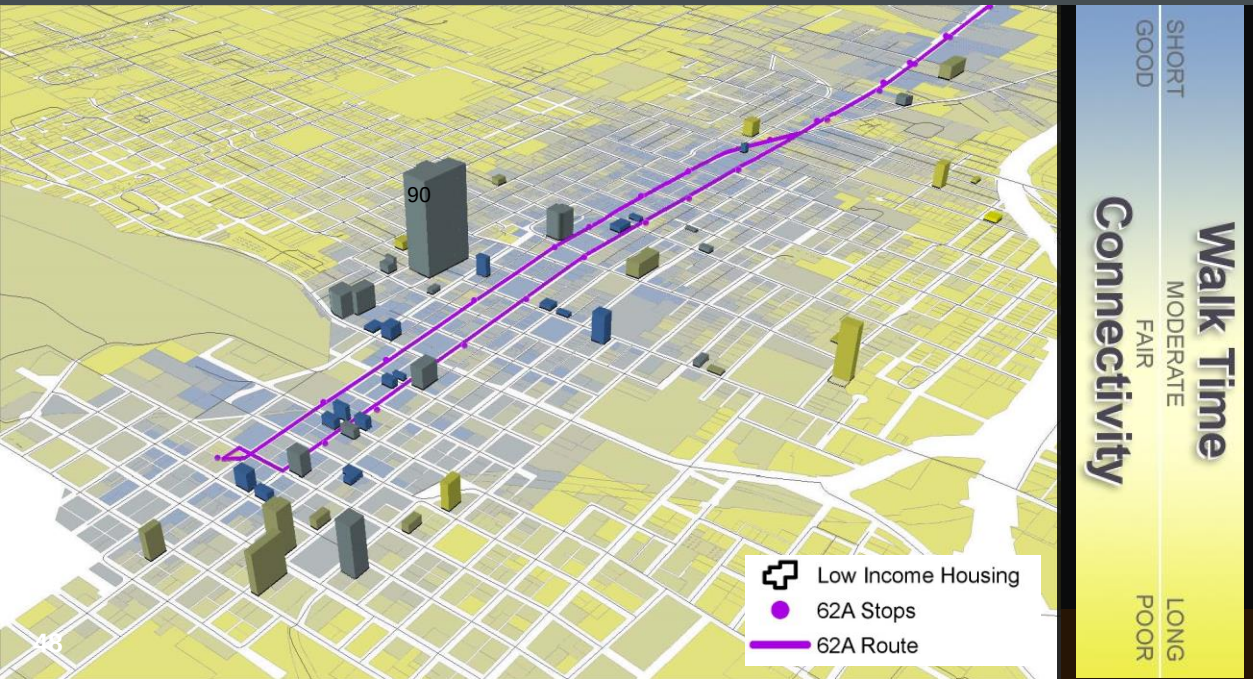
Walk Time Score

- Early 20th Century development
- Tight street grid
- Mixed-use

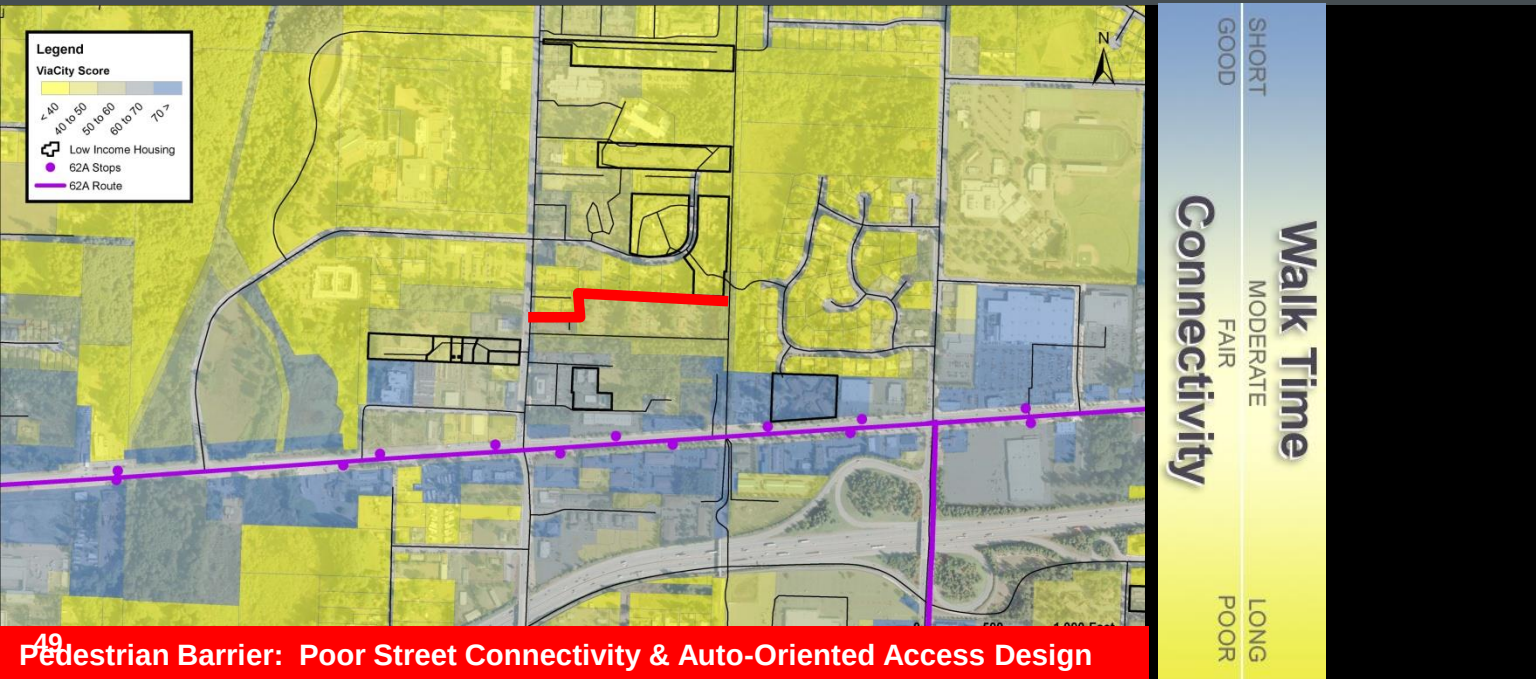




Area 3: Composite RDI / Walk Time Score

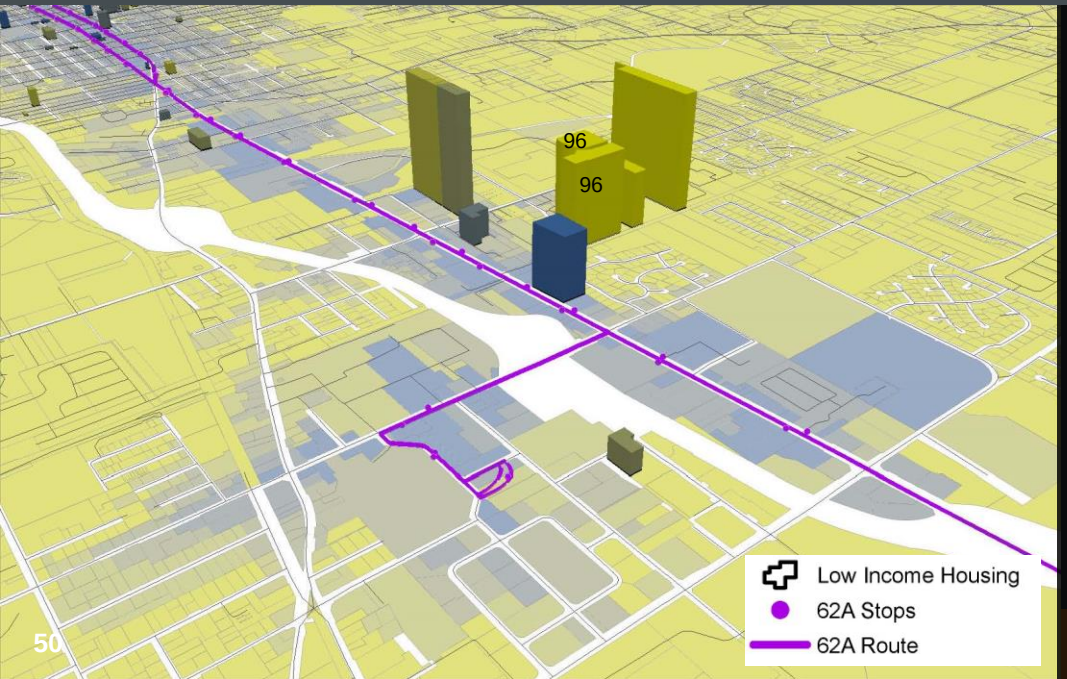


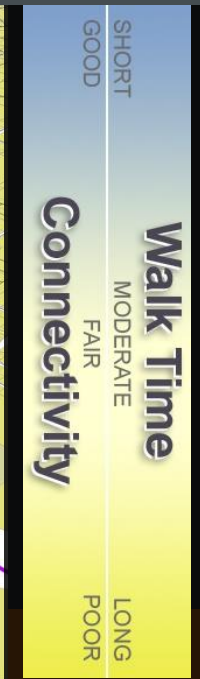
Area 2: Composite RDI / Walk Time Score



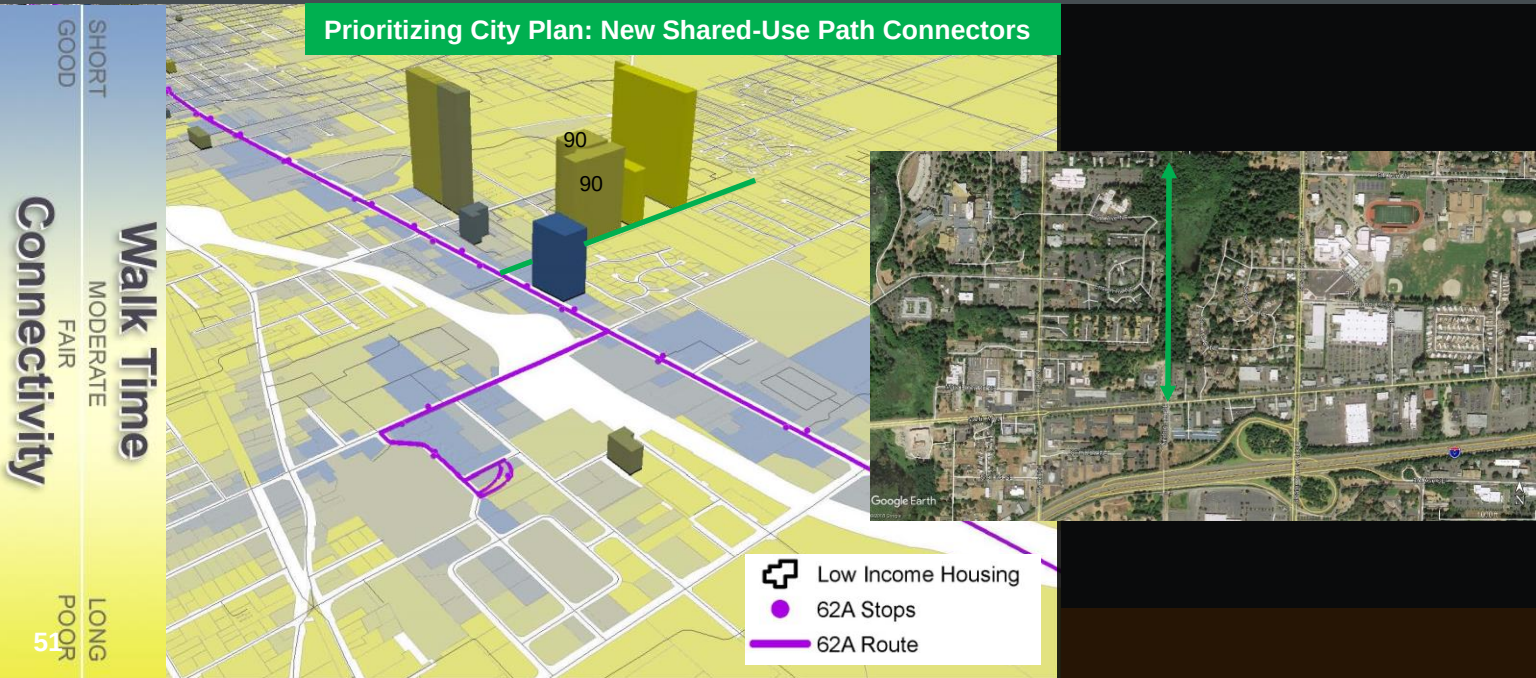
Pedestrian Barrier: Poor Street Connectivity & Auto-Oriented Access Design

Area 2: Poor Street Network Design

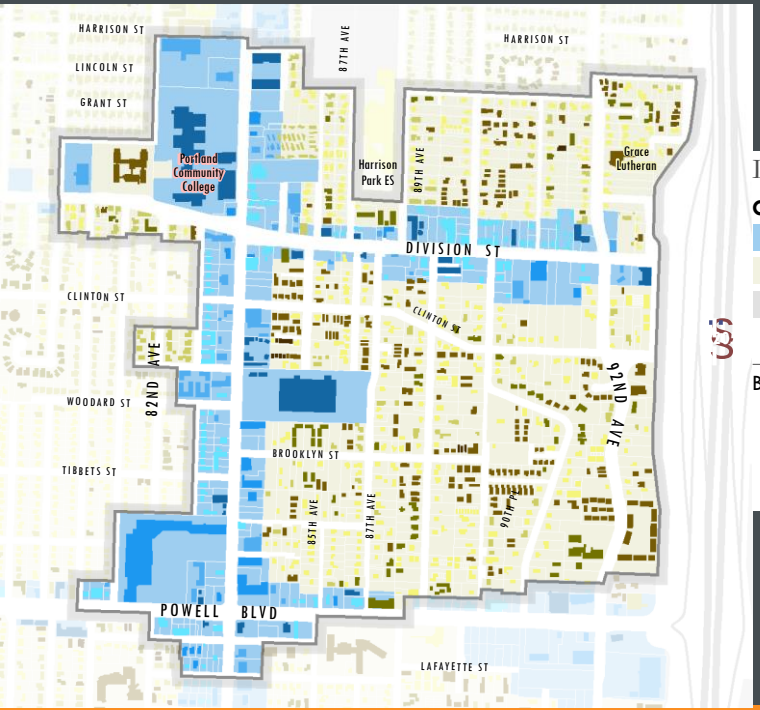




Area 2: Impact of City Bike Plan Priority



Connected Centers – Jade District



Building Age

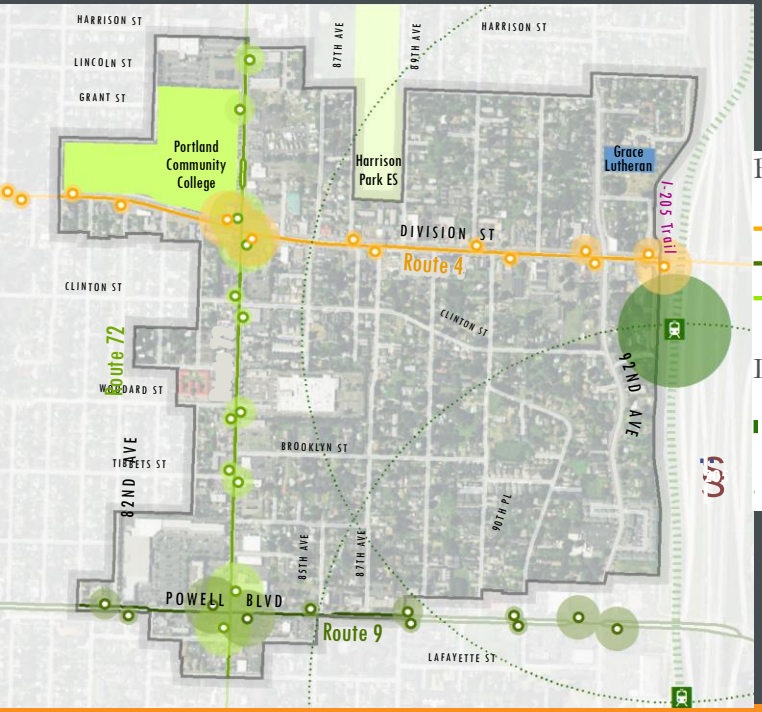
Legend

General Zoning Designations

- Commercial Zone
- Residential Zone
- Other Zoning Designation

Building Age	Residential	Commercial
Built before 1950		
1951 to 1970		
1971 to 1990		
1991 to 2010		
Built after 2010		

Connected Centers – Jade District



Transit System

Bus Routes and Boardings

- Bus Route 4
- Bus Route 9
- Bus Route 72

Up to 50 | 50 to 100 | 100 to 250 | 250 to 500

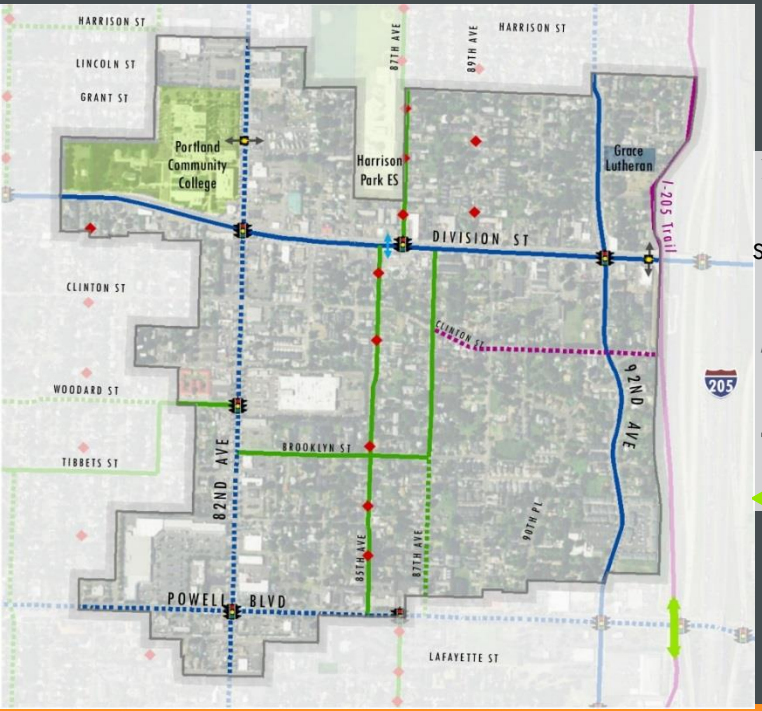
Light Rail

- Green MAX Line
- Half Mile Buffer from Light Rail Station

Other Features

- Parks and/or Natural Areas
- School
- Place of Worship

Connected Centers – Jade District



Bicycle System

Bike Network

	Active/Planned	Recommended
Separated in Roadway		
Shared Roadway		
Trail		

Traffic Control

- Rapid Flashing Beacon
- Pedestrian and Bicycle Crossing
- Pedestrian Bridge
- Pedestrian and Bicycle Bridge

- Parks and/or Natural Areas
- School
- Place of Worship

Connected Centers – Jade District

Pedestrian System

Sidewalk Network

	Active/Planned	Recommended
Sidewalk		
Trail		

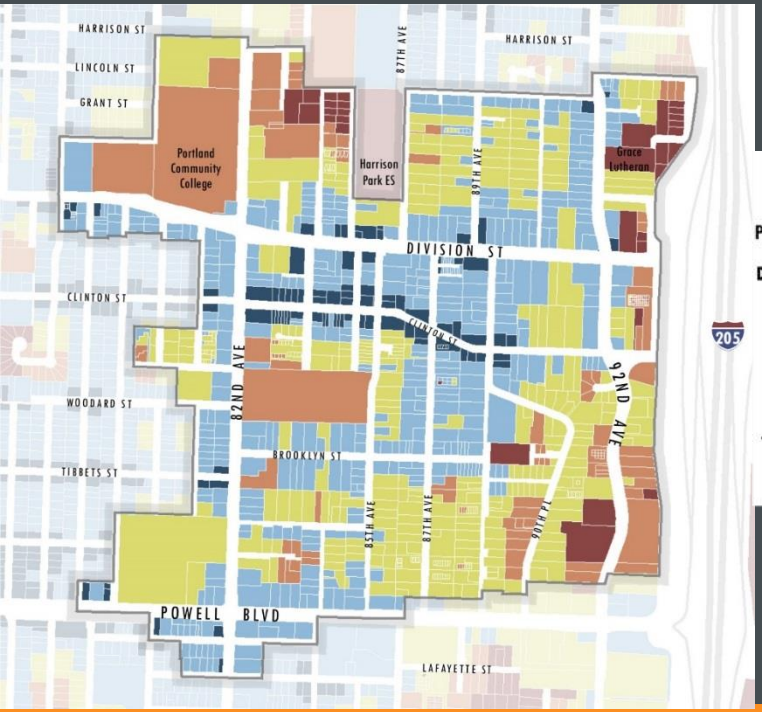
Traffic Control

- Traffic Signal
- Rapid Flashing Beacon
- Speed Bump
- Crosswalk
- Pedestrian and Bicycle Crossing
- Pedestrian Bridge
- Pedestrian and Bicycle Bridge

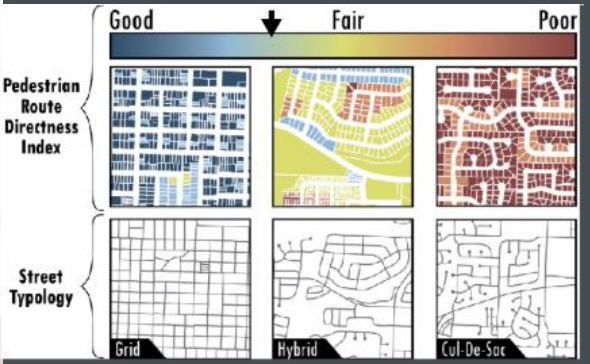
Other Features

- Parks and/or Natural Areas
- School
- Place of Worship

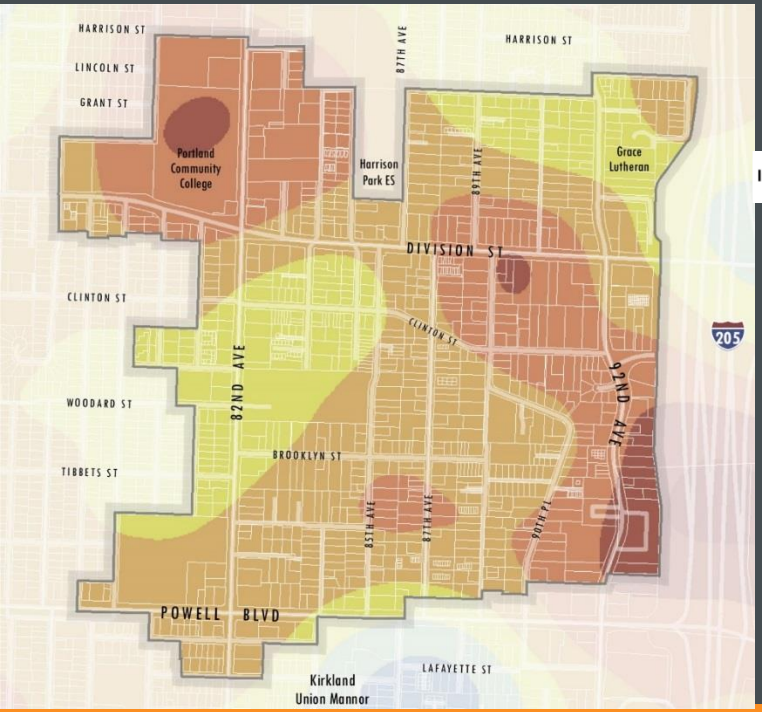
Connected Centers – Jade District



Route Directness Index



Connected Centers – Jade District



Intersection Density

Connected Centers – Jade District

Barriers

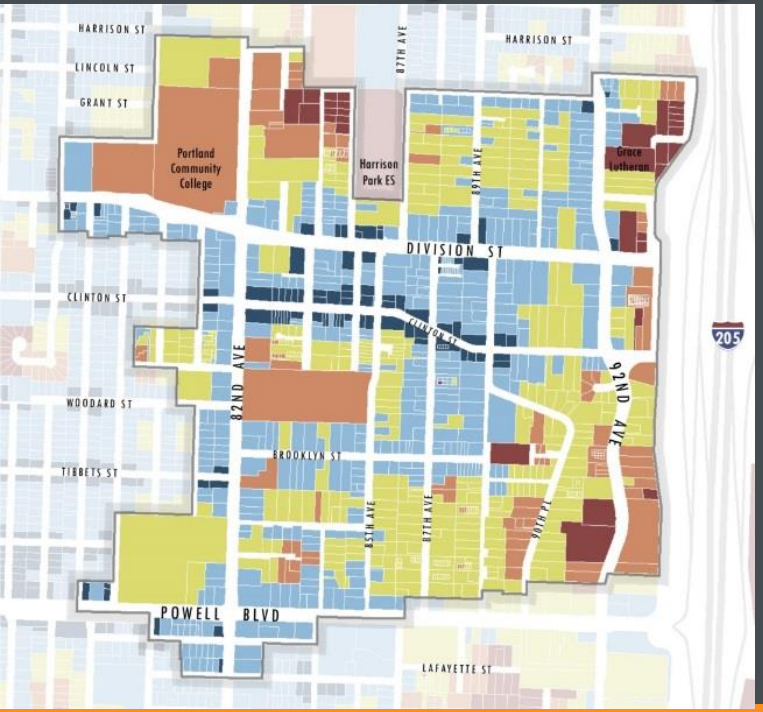
Connectivity Barriers

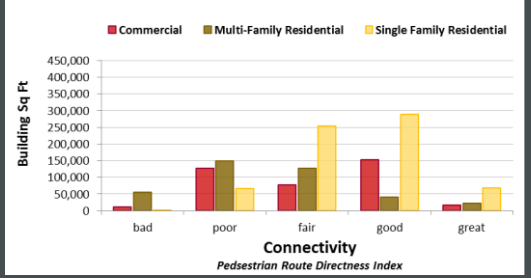
- Dead-end Streets
- Property Boundary - 'Hard Fence'

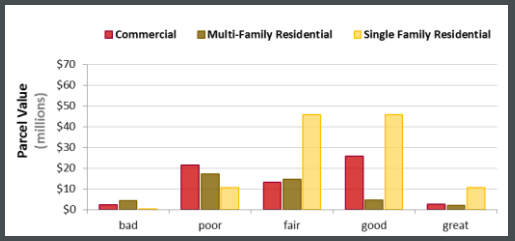
Other Features

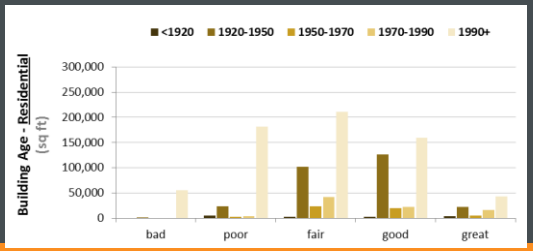
- Parks and/or Natural Areas
- School
- Church
- Multi-Use Trail

Connectivity - Today

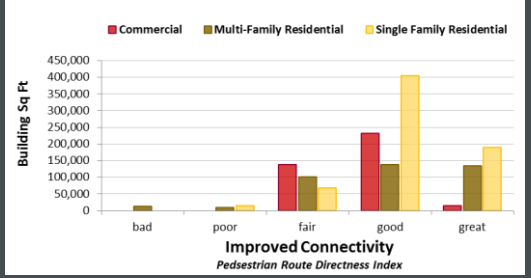


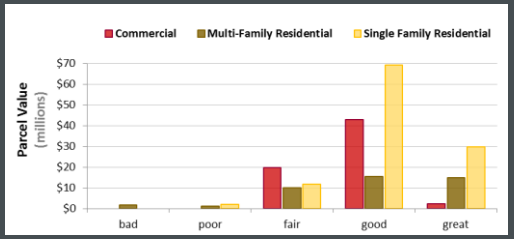


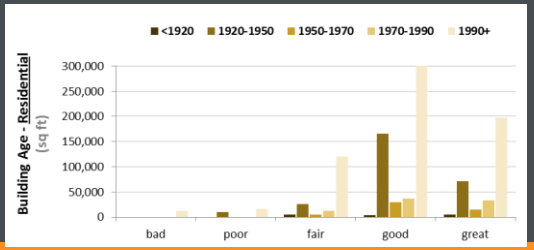




Connectivity - Plan

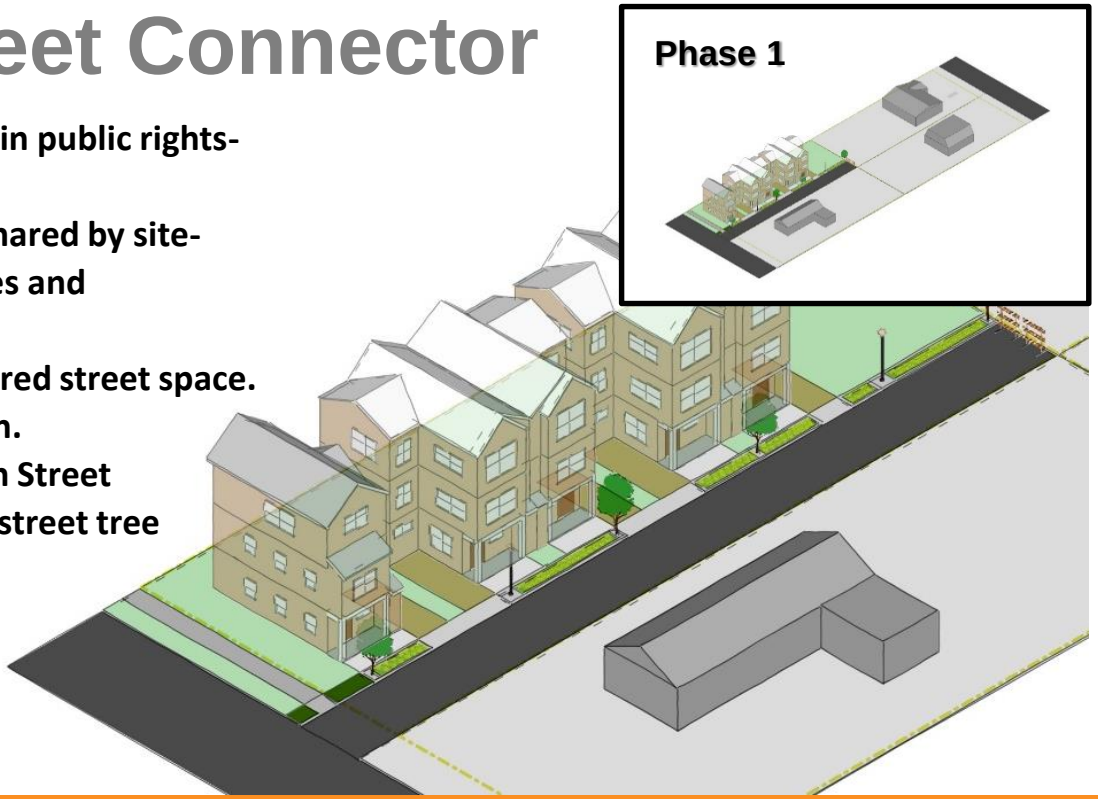






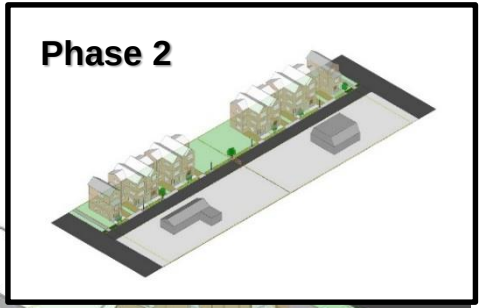
Public Street Connector

- ✓ Interim Driveway within public rights-of-way.
- ✓ Narrow street space shared by site-generated cars, bicycles and pedestrians.
- ✓ Interim signing for shared street space.
- ✓ No through connection.
- ✓ Buffer strip with Green Street drainage, lighting and street tree features.



Public Street Connector

- ✓ **Partially completed Public Street and sidewalk within public rights-of-way added with new development.**
- ✓ **Through-connection for pedestrians and bicyclists only - barricades to prohibit vehicle through-traffic.**
- ✓ **Buffer strip with Green Street drainage, lighting and street tree features.**



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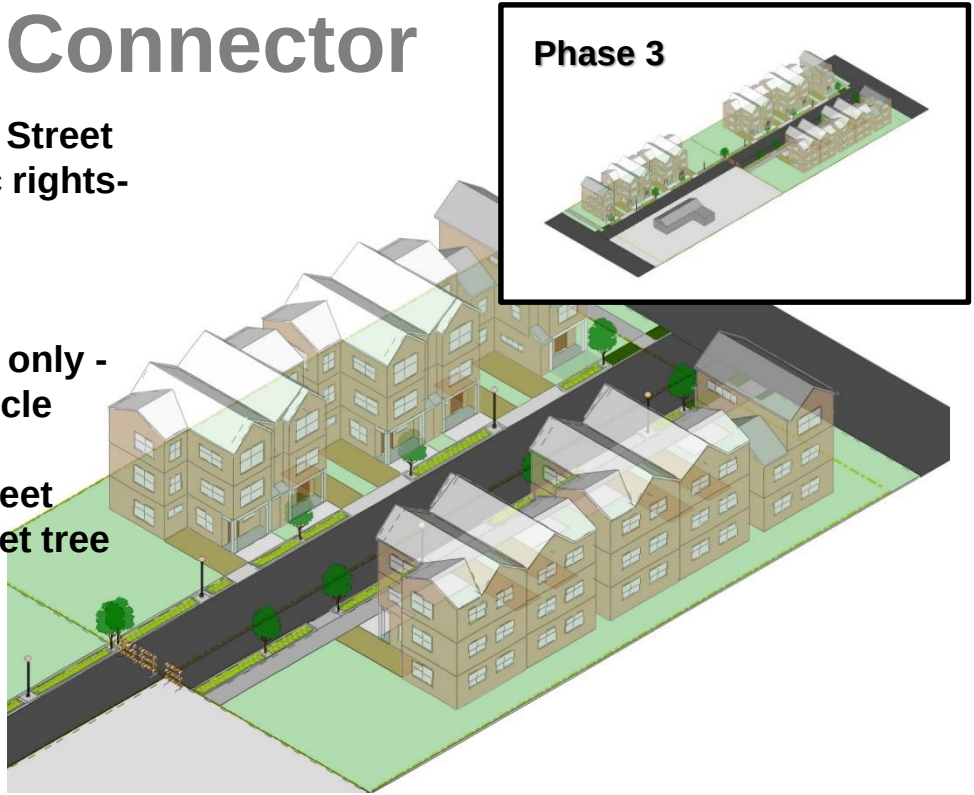
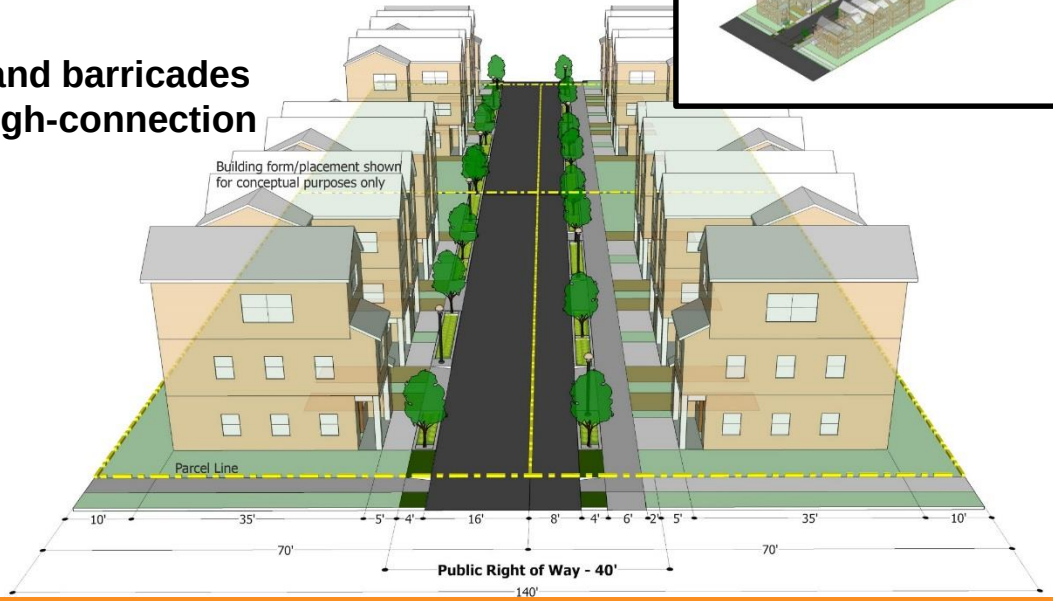


Public Street Connector

- ✓ **Completed Public Street and sidewalk added with new development.**
- ✓ **Interim signing and barricades removed – through-connection for all modes.**



Planning Partners: Denver Igarta, PBOT Complete Street Program Manager / Jacob Niger,Toole Design