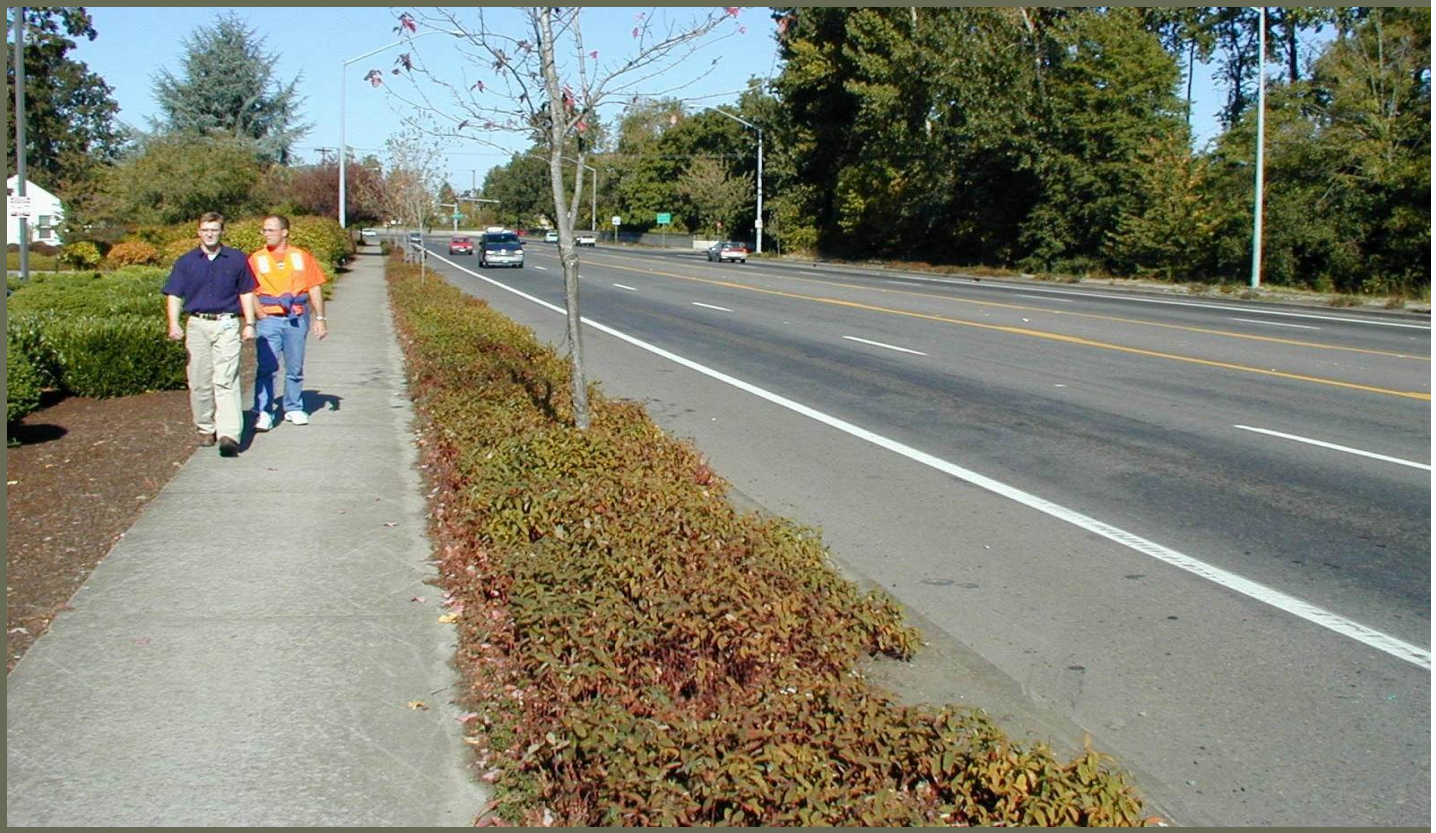
Walking Along the Road



Module 2

Learning Outcomes:

- At the end of this module, you will be able to:
- Describe the operational and safety benefits of shoulders and sidewalks
- Select the appropriate design for sidewalks

Calculating Reduction in Number of Crashes

Crash Modification Factor (CMF): factor used to compute the expected number of crashes after implementing a given countermeasure.

Crash Reduction Factor (CRF): % fewer crashes experienced on a road with a given countermeasure than on similar road without the countermeasure

Relationship between CMF and CRF:

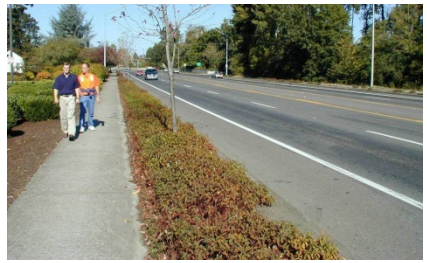
$$CMF = 1 - (CRF/100)$$

$$CRF = 100*(1 – CMF)$$

(Examples on next slide)

CMF/CFR Clearinghouse: www.cmfclearinghouse.org

Shoulders and Sidewalks



- Walking along the road accounts for 10-15% of fatal pedestrian crashes:
  - Fewer in urban areas
  - More in rural areas
- They're easily preventable
- Paved shoulders reduce pedestrian crashes by 70% (CRF)
  - CMF = 0.3
    - Gan et al. study
- Sidewalks reduce pedestrian crashes by 88% (CRF)
  - CMF=0.12
    - McMahon Study

Shoulders improve safety for all users

2-5 **Sonoma Co. CA**

For motorists: room to avoid crashes

Shoulders improve safety for all users

For bicyclists: a place to ride

Shoulders improve safety for all users

2-7 **Benton Co. OR**

For pedestrians: a place to walk

CMF = 0.3 (CRF = 70%)

Canyonville OR

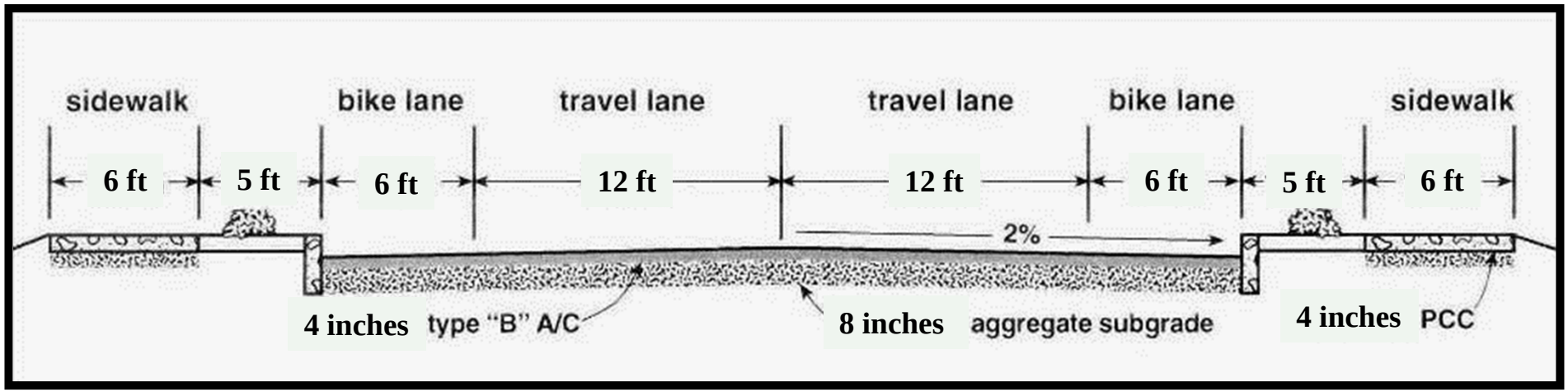
At a certain point, sidewalks are needed

"Goat trail" indicates sidewalks are needed

The 2011 AASHTO "Green Book" states:

"Sidewalks are an integral parts of city streets"

Quote from 2011 AASHTO Green Book 4.17.1 Sidewalks



Sidewalks are not added to streets, they are <u>part of the street</u>

Sidewalks reduce pedestrian crash risk by 88%

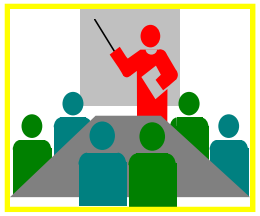
Curbs & sidewalks slow traffic more than speed sign

Coburg OR

Sidewalks define an urban street

Discussion: Why are sidewalks discontinuous?

Beaverton OR



Discussion:Why are sidewalks on one side not OK?

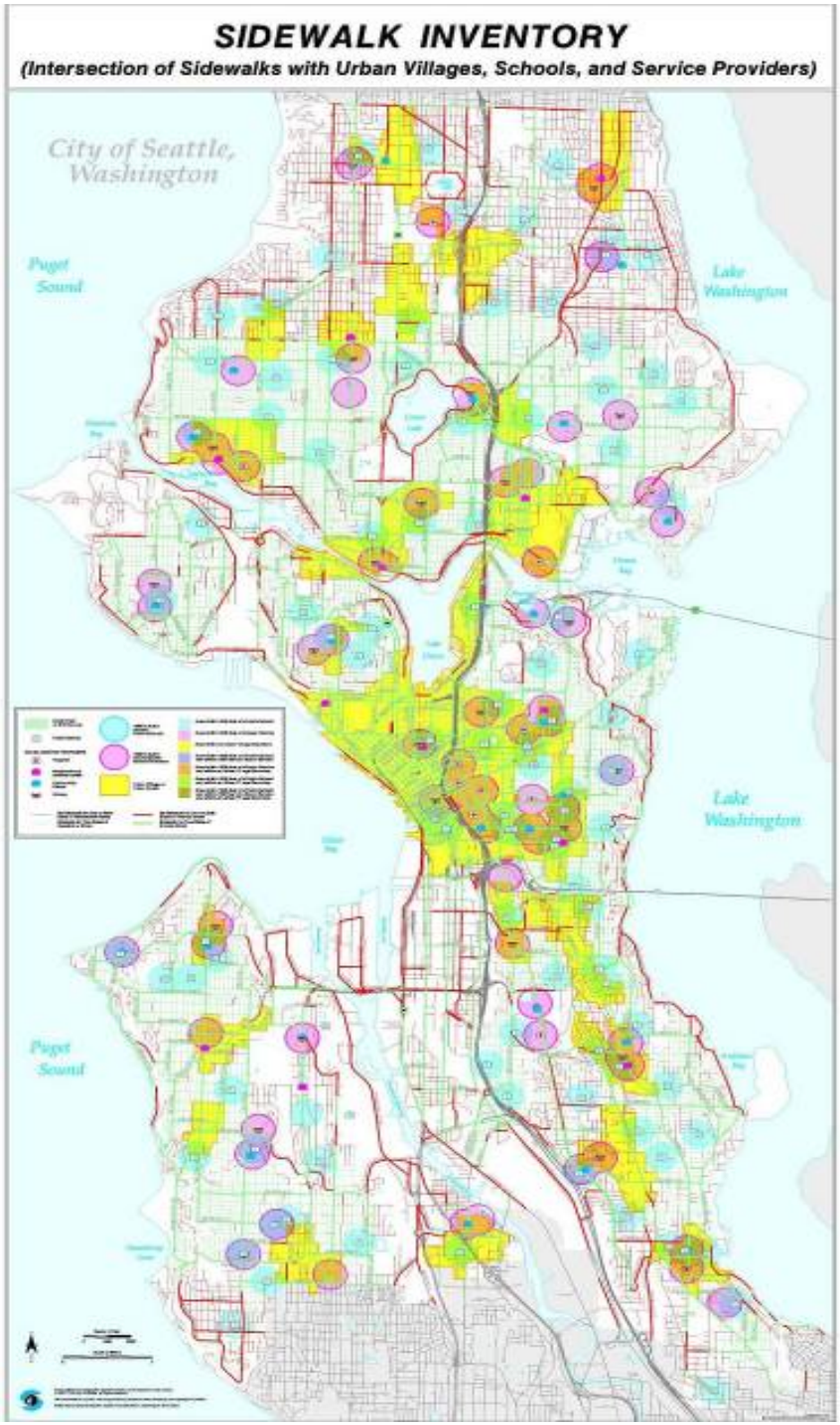
Answer: Pedestrians walk in street, or cross twice

Sample Implementation Strategy to retrofit existing streets w/sidewalks

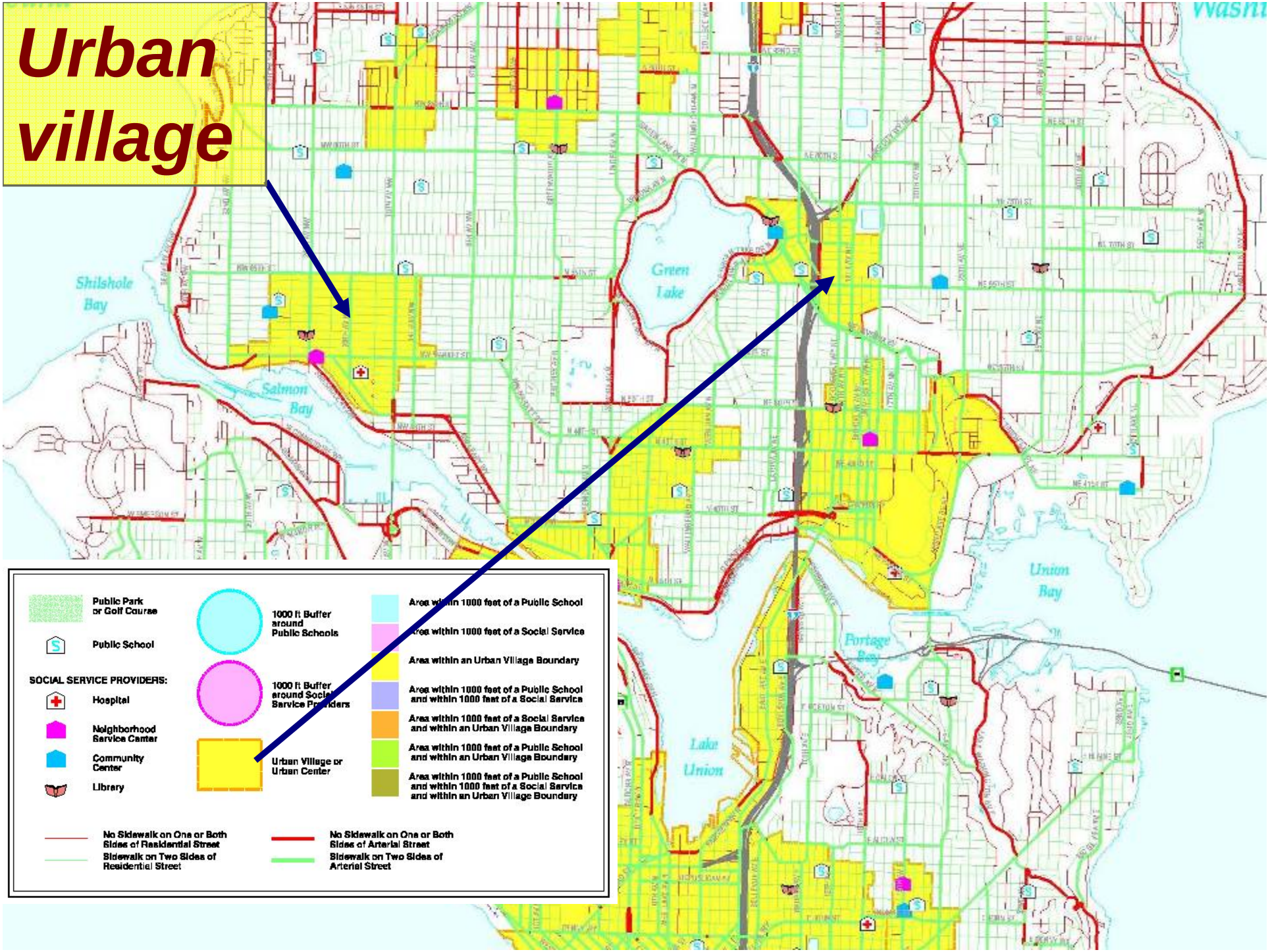
2-15 **Seattle WA**

Develop a program to fill in missing sidewalks over 20 years

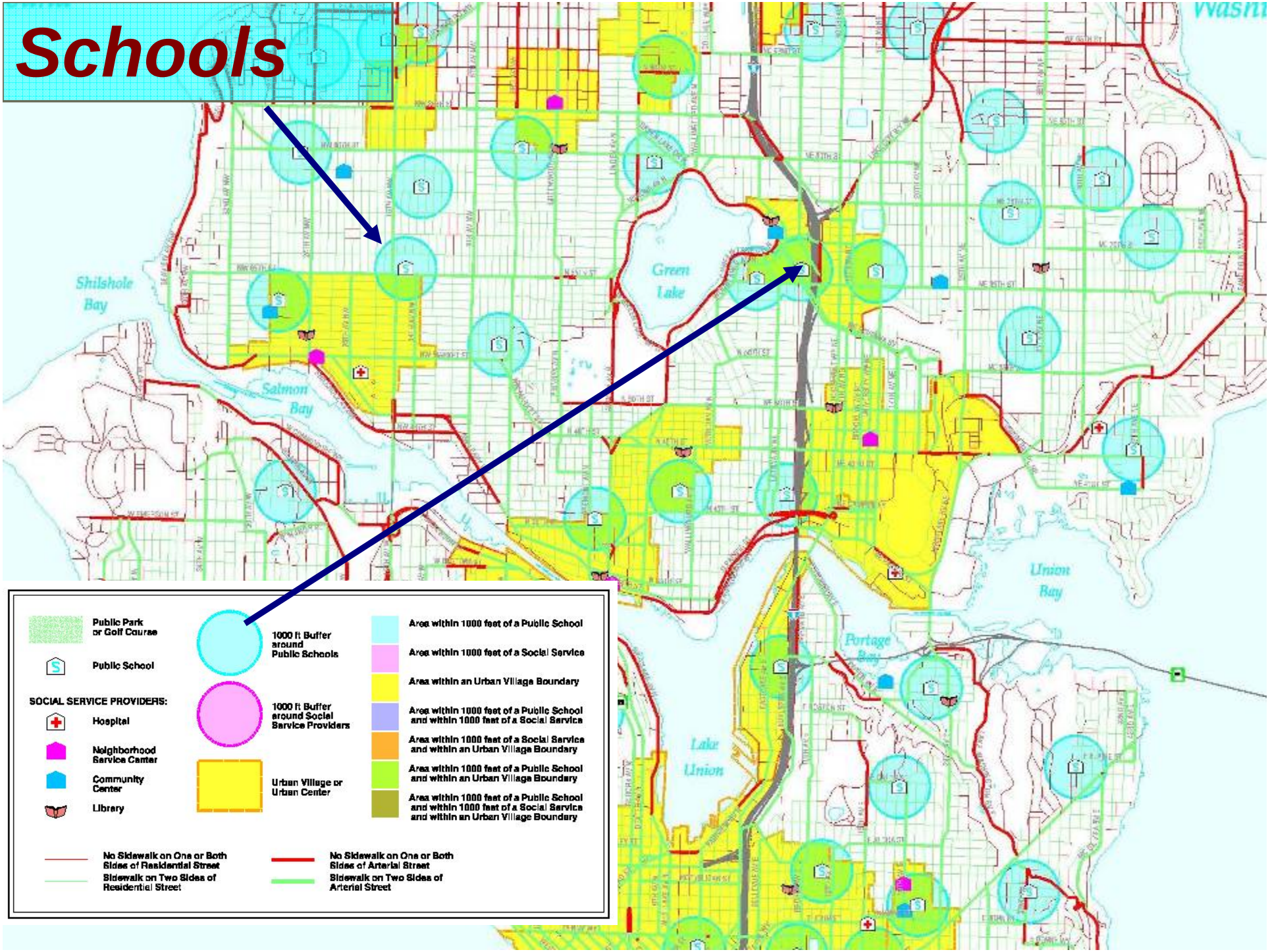
- How do you make such a daunting task manageable?
- Seattle example: divide it into bite-size chunks, with overlapping priorities



Urban village



Schools


Shilshole Bay
Green Lake
Salmon Bay
Union Bay
Portage Bay
Lake Union
Public Park or Golf Course
Public School
SOCIAL SERVICE PROVIDERS:
Hospital
Neighborhood Service Center
Community Center
Library
1000 ft Buffer around Public Schools
1000 ft Buffer around Social Service Providers
Urban Village or Urban Center
Area within 1000 feet of a Public School
Area within 1000 feet of a Social Service
Area within an Urban Village Boundary
Area within 1000 feet of a Public School and within 1000 feet of a Social Service
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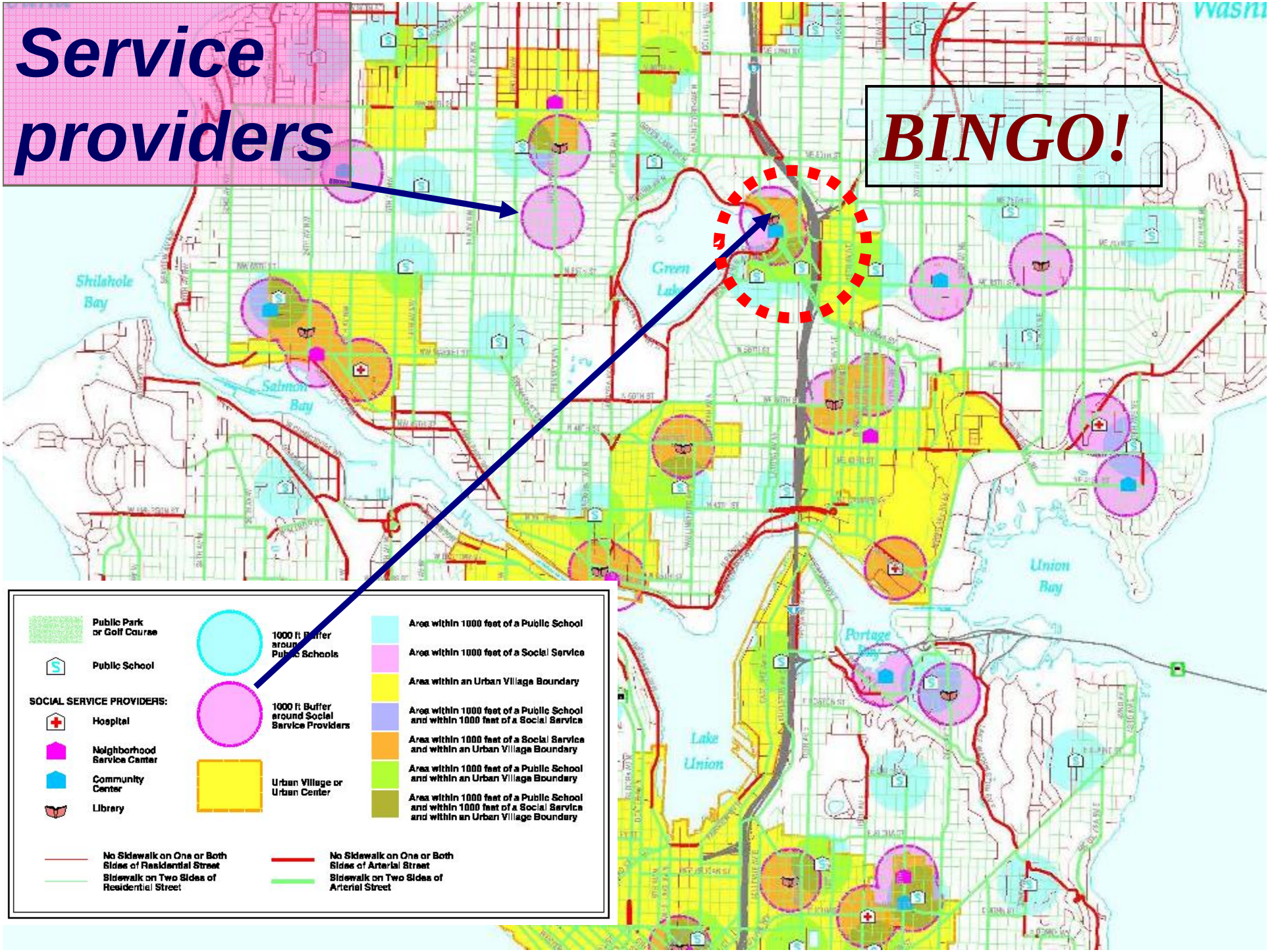
No Sidewalk on One or Both Sides of Residential Street
Sidewalk on Two Sides of Residential Street
No Sidewalk on One or Both Sides of Arterial Street
Sidewalk on Two Sides of Arterial Street


Service providers
BINGO!
Public Park or Golf Course
Public School
SOCIAL SERVICE PROVIDERS:
Hospital
Neighborhood Service Center
Community Center
Library
1000 ft Buffer around Public Schools
1000 ft Buffer around Social Service Providers
Urban Village or Urban Center
Area within 1000 feet of a Public School
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Shilshole Bay
Salmon Bay
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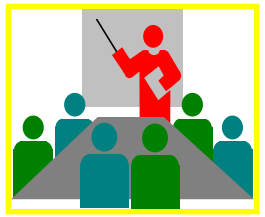
Union Bay
Portage Bay

Discussion:

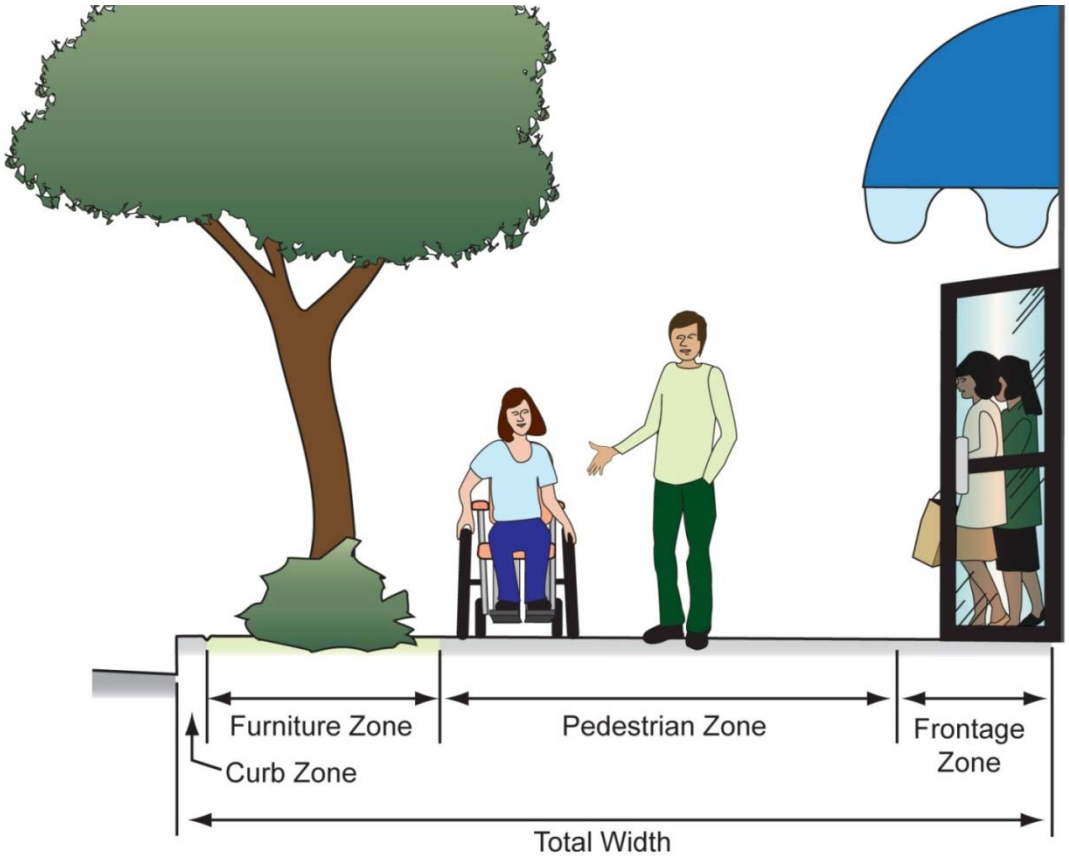


- What are your requirements for sidewalks:
- What are the triggers?
- Who pays for them?
- Who maintains them?

Sidewalk Corridors – The Zone System

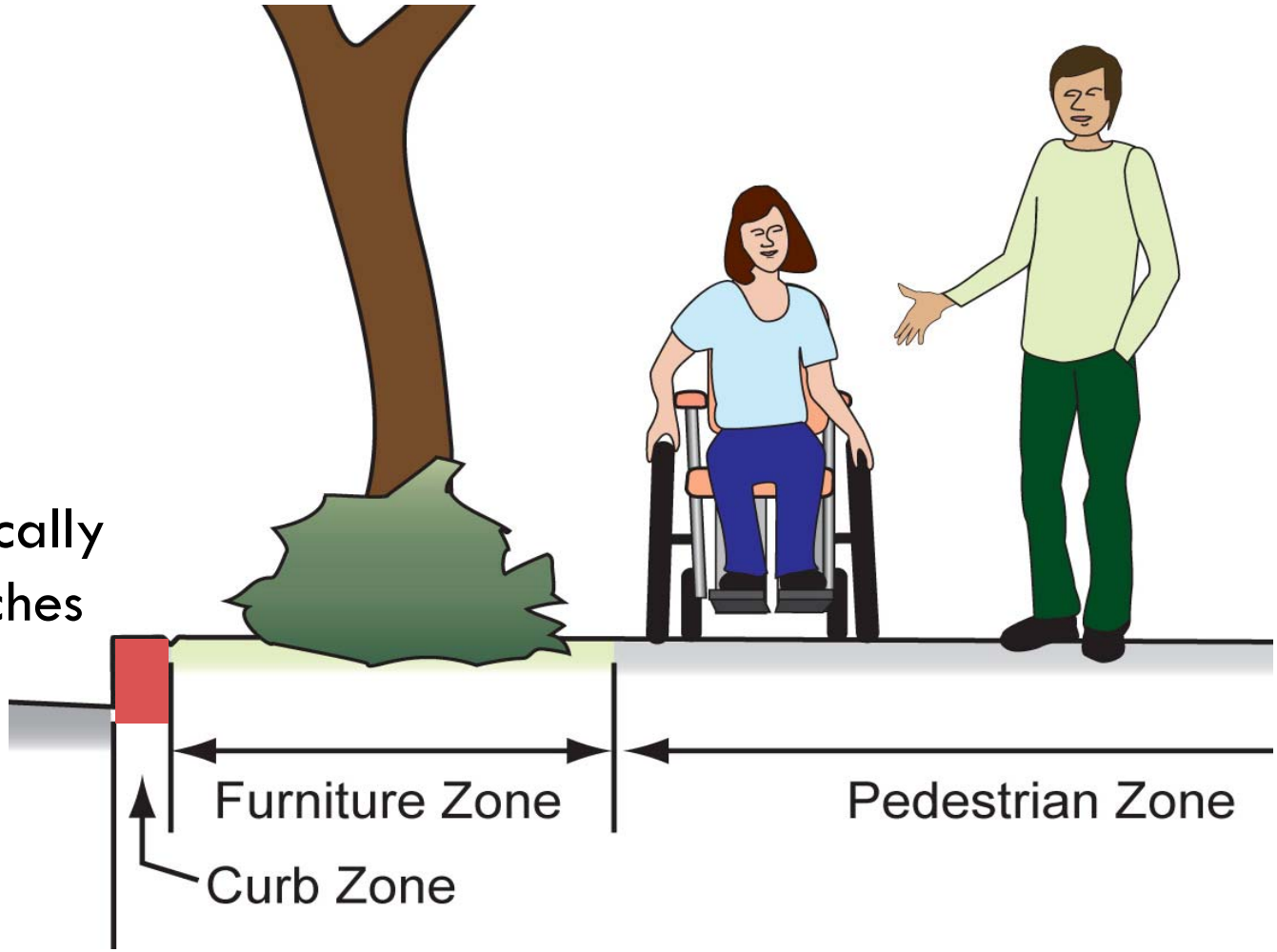
The sidewalk corridor extends from the edge of roadway to the right-of-way and is divided into 4 zones:

- Curb zone
- Furniture zone
- Pedestrian zone
- Frontage zone



Curb Zone

Typically
6 inches



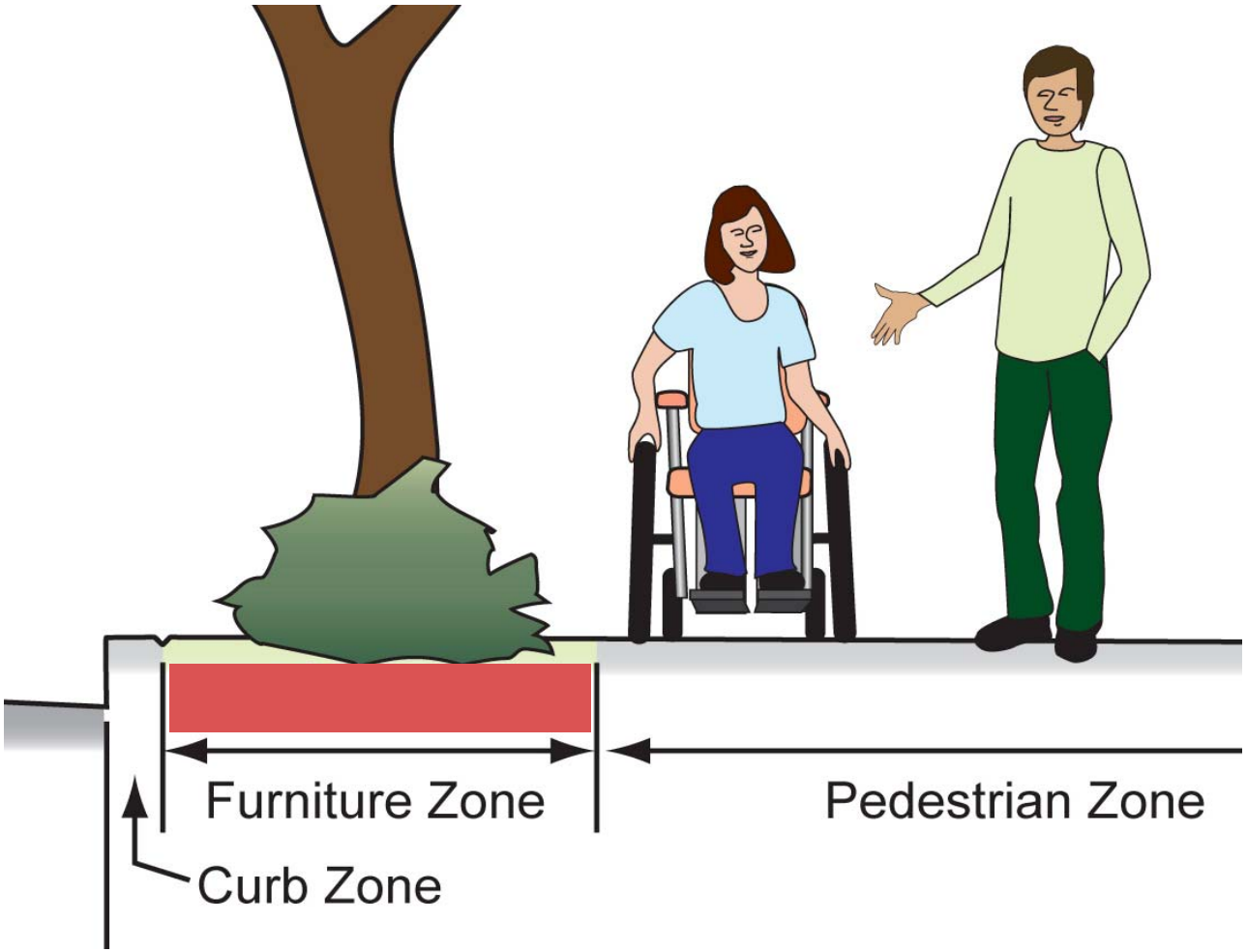
Why the curb zone matters: Mountable curbs are inappropriate on local streets

Why the curb zone matters: It's where pedestrians transition from/to the street

Curbs & drainage are the greatest sidewalk cost

This sidewalk cost little to install w/o curb

Furniture Zone



- Local or collector streets 2 to 4 ft
- Arterial or major streets 4 to 6 ft

All the “stuff” goes in the furniture zone

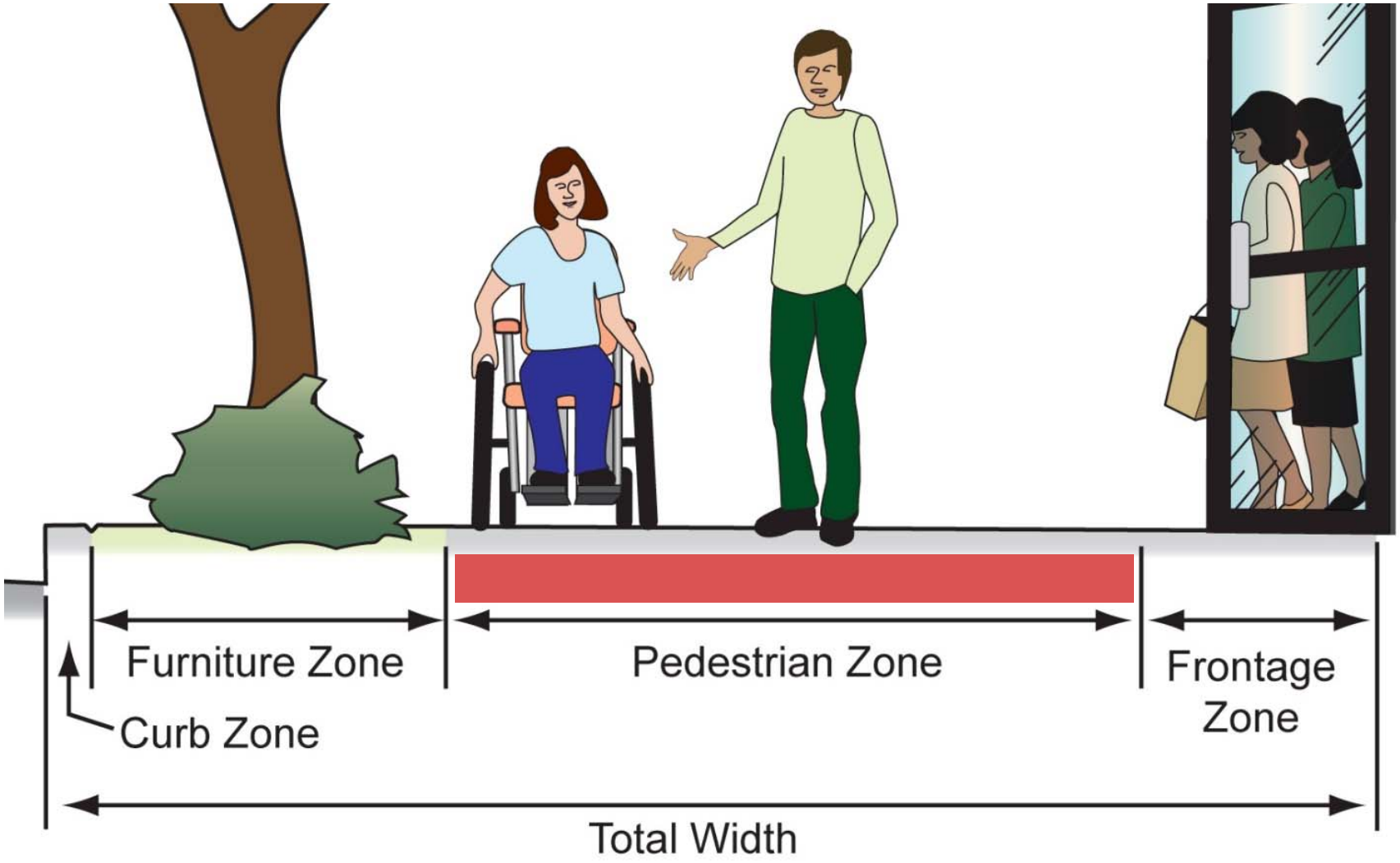
The furniture zone keeps the sidewalk clear

Sidewalk with furniture zone is pleasant to walk on

Corvallis OR

Planter strip helps define driveways, it's easier for drivers to find them and they're more likely to yield to pedestrians

Pedestrian Zone



Henderson, NV

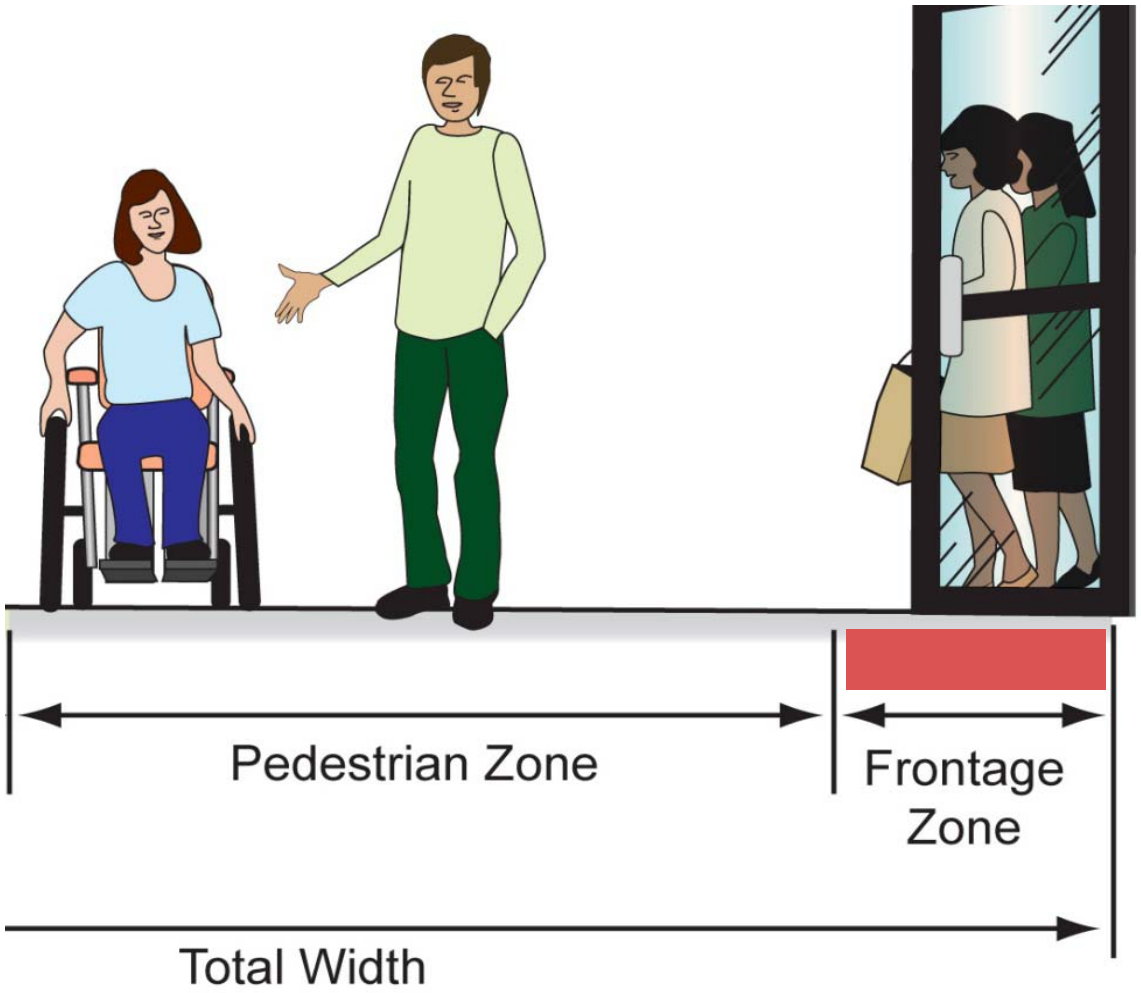
5 feet necessary for two people to walk comfortably side by side or to pass each other; 6’ preferred

Sidewalk should be as wide as needed to serve anticipated pedestrian use (use HCM ped LOS)

Minimum Sidewalk Recommendations

- Local or collector streets 5 ft
- Arterial or major streets 6 to 8 ft
- Along parks, schools, and other major pedestrian generators 8 to 10 ft
- CBD areas 8 to 12 ft
  - 8-ft minimum in commercial areas with a planter strip, 12-ft minimum in commercial areas with no planter strip

Frontage Zone



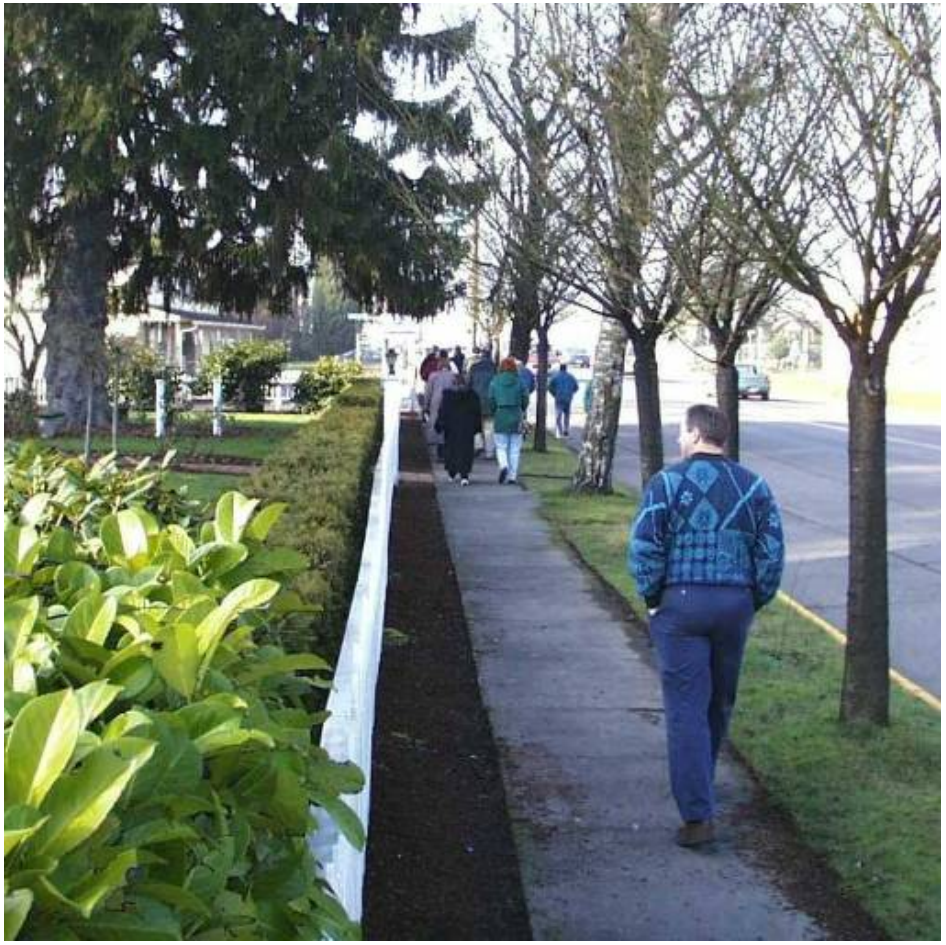
- Doors, planters, etc…
  - 3 feet
- Café seating
  - 8 feet

Reno NV

Shy distance concept applies to pedestrians, who will shy away from a vertical face; extra width is needed

Madison WI

An interesting façade makes narrow sidewalks feel wider



- Fence placement and type impacts pedestrian comfort: the sidewalk on the left is wider, but feels narrow due to high and adjacent chain link fence

Before ***After***

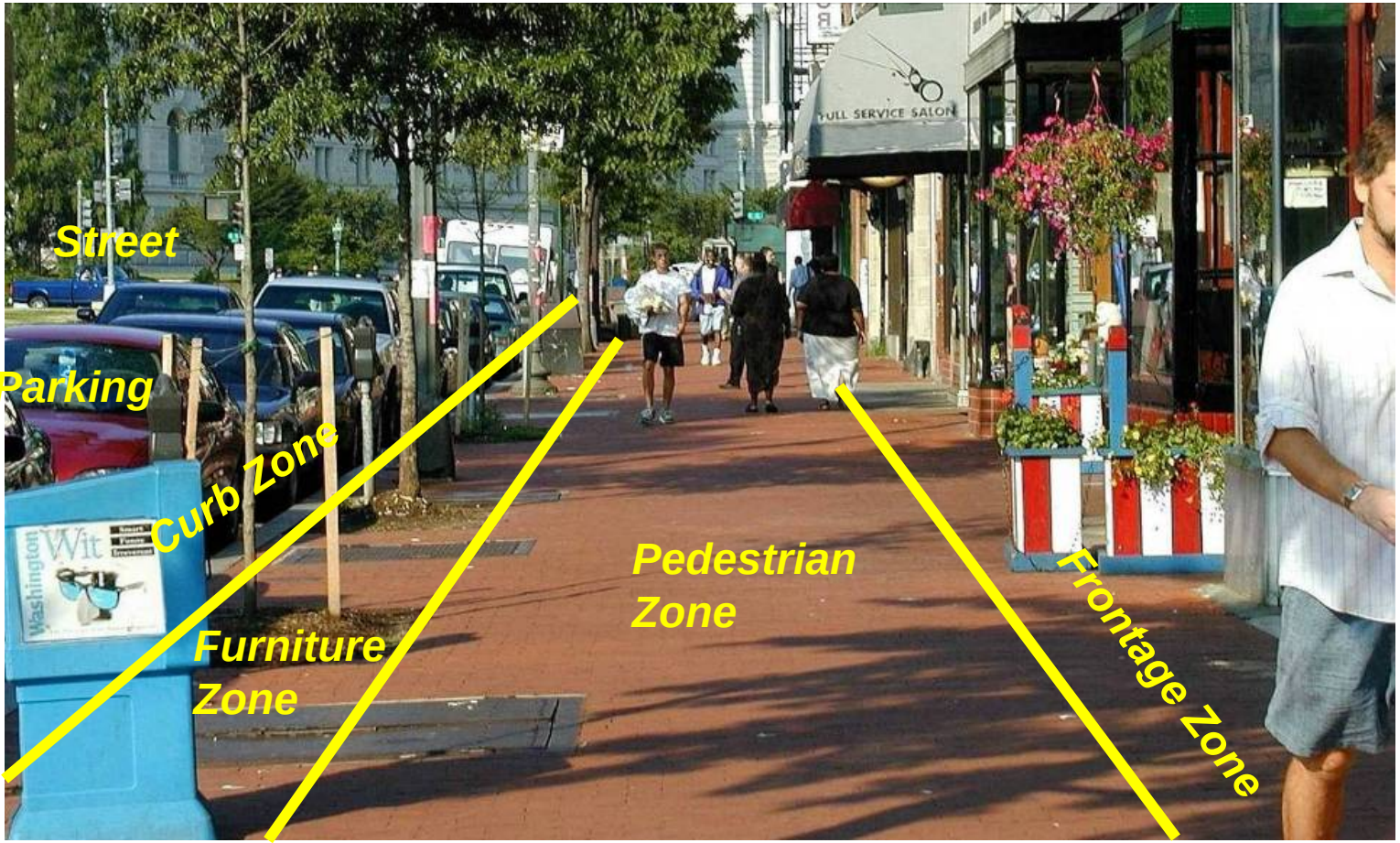
One foot of frontage zone between right-of-way line and sidewalk makes maintenance easier

The Zone System - Summary

Residential street

The Zone System - Summary

2-42 **Washington DC**



Commercial street

With Zone System

2-43 **Washington DC**

Street furniture arranged in zones leaves sidewalk clear

Without Zone System

2-44 **Silverton OR**

Randomly placed street furniture clutters sidewalk

Without Zone System

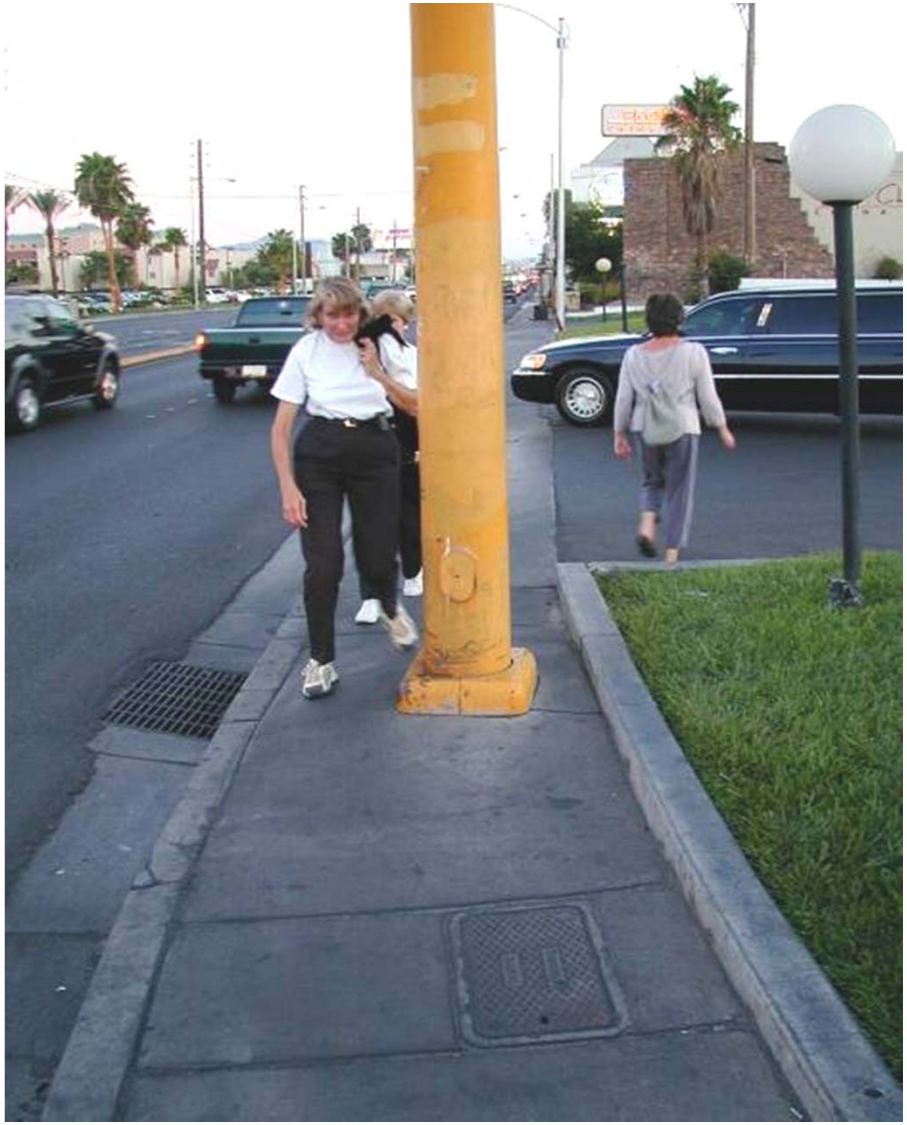
No buffer between pedestrians and traffic

ADA requirements for sidewalks

- Well-designed sidewalks meet ADA:
- Sidewalks should be clear of obstructions:
  - 3' min clearance, 4' proposed
- Sidewalk should have smooth surface
- Sidewalk should be at 2% max cross-slope including at driveways

- The zone system creates a safer and more pleasant place to walk, and makes it easier to meet ADA requirements.

Best resource for ADA: Public Right-of-Way Accessibility Guidelines (PROWAG) draft. http://www.access-board.gov/prowac/draft.htm



Utilities & poles should not obstruct sidewalk

Mitigate around obstacles on narrow curbside sidewalk

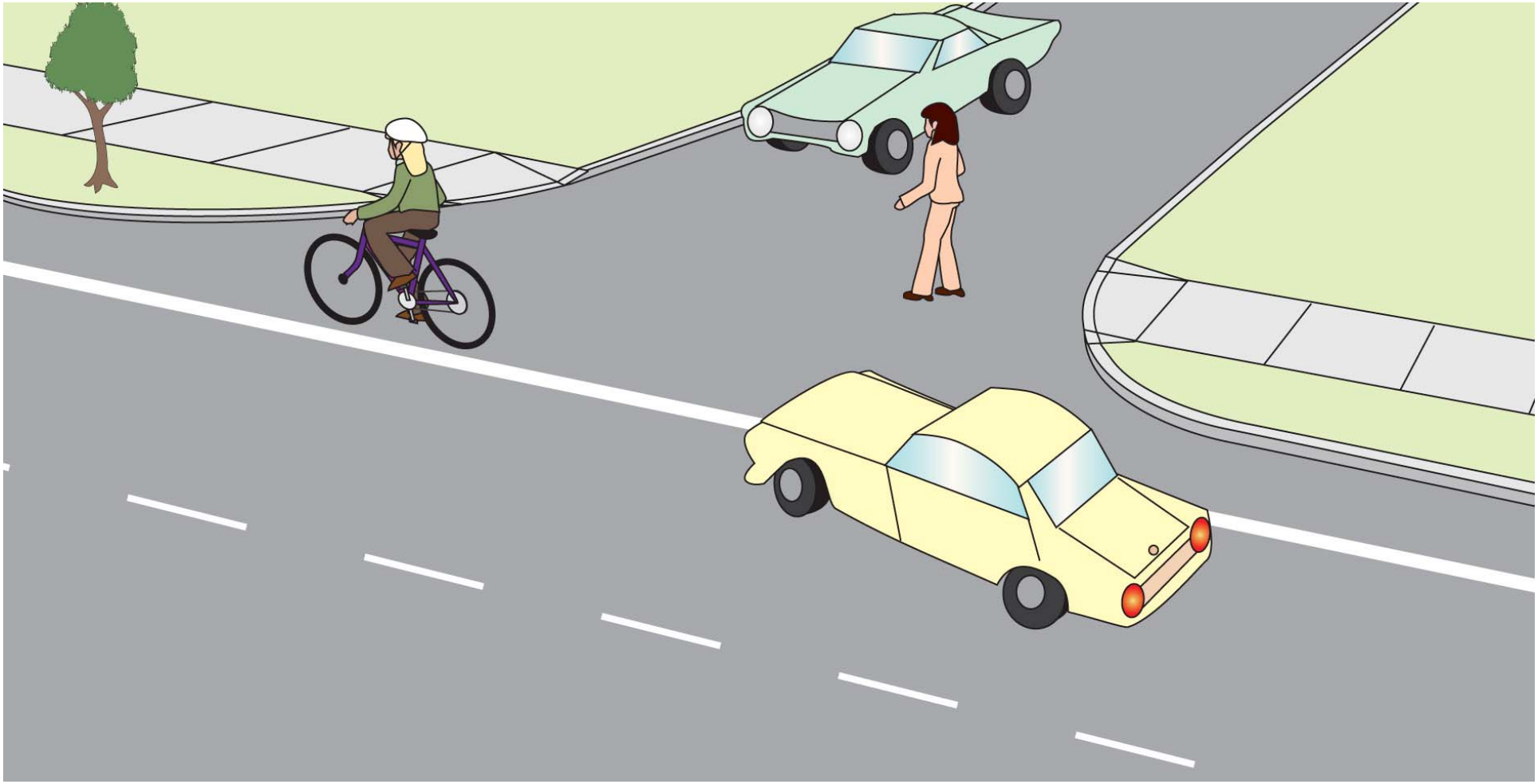
Recommendations from Model Design Manual for Living Streets

	Boulevard	Avenue	Street
Low / Medium-Low Density Residential	Not applicable	Frontage: 18" Pedestrian: 5' Furniture: 4', 6'-8' at bus stops and where large trees are desired Curb: 6" Min. Width: 11'	Frontage: 18" Pedestrian: 5' Furniture: 4' Curb: 6" Min. Width: 11'
Med / High Density Residential	Frontage: 18" Pedestrian: 6' Furniture: 5', 6'-8' at bus stops and where large trees are desired Curb: 6" Min. Width: 13'	Frontage: 18" Pedestrian: 6' Furniture: 5', 6'-8' at bus stops and where large trees are desired Curb: 6" Min. Width: 13'	Frontage: 18" Pedestrian: 6' Furniture: 4', 6'-8' at bus stops and where large trees are desired Curb: 6" Min. Width: 12'
Neighborhood Commercial	Not applicable	Frontage: 18" Pedestrian: 6' Furniture: 5', 6'-8' at bus stops and where large trees are desired Curb: 6" Min. Width: 13'	Frontage: 18" Pedestrian: 6' Furniture: 4', 6'-8' at bus stops and where large trees are desired Curb: 6" Min. Width: 12'
General Commercial	Frontage: 18" Pedestrian: 6' Furniture: 5', 6'-8' at bus stops and where large trees are desired Curb: 6" Min. Width: 13'	Frontage: 18" Pedestrian: 6' Furniture: 5', 6'-8' at bus stops and where large trees are desired Curb: 6" Min. Width: 13'	Not applicable
Mixed / Multi-use	Frontage: 30", 8' with cafe seating Pedestrian: 6' Furniture: 5', 6'-8' at bus stops and where large trees are desired Curb: 6" Min. Width: 14'	Frontage: 30", 8' with cafe seating Pedestrian: 6' Furniture: 4', 6'-8' at bus stops and where large trees are desired Curb: 6" Min. Width: 13'	Frontage: 18" Pedestrian: 6' Furniture: 4' Curb: 6" Min. Width: 12'

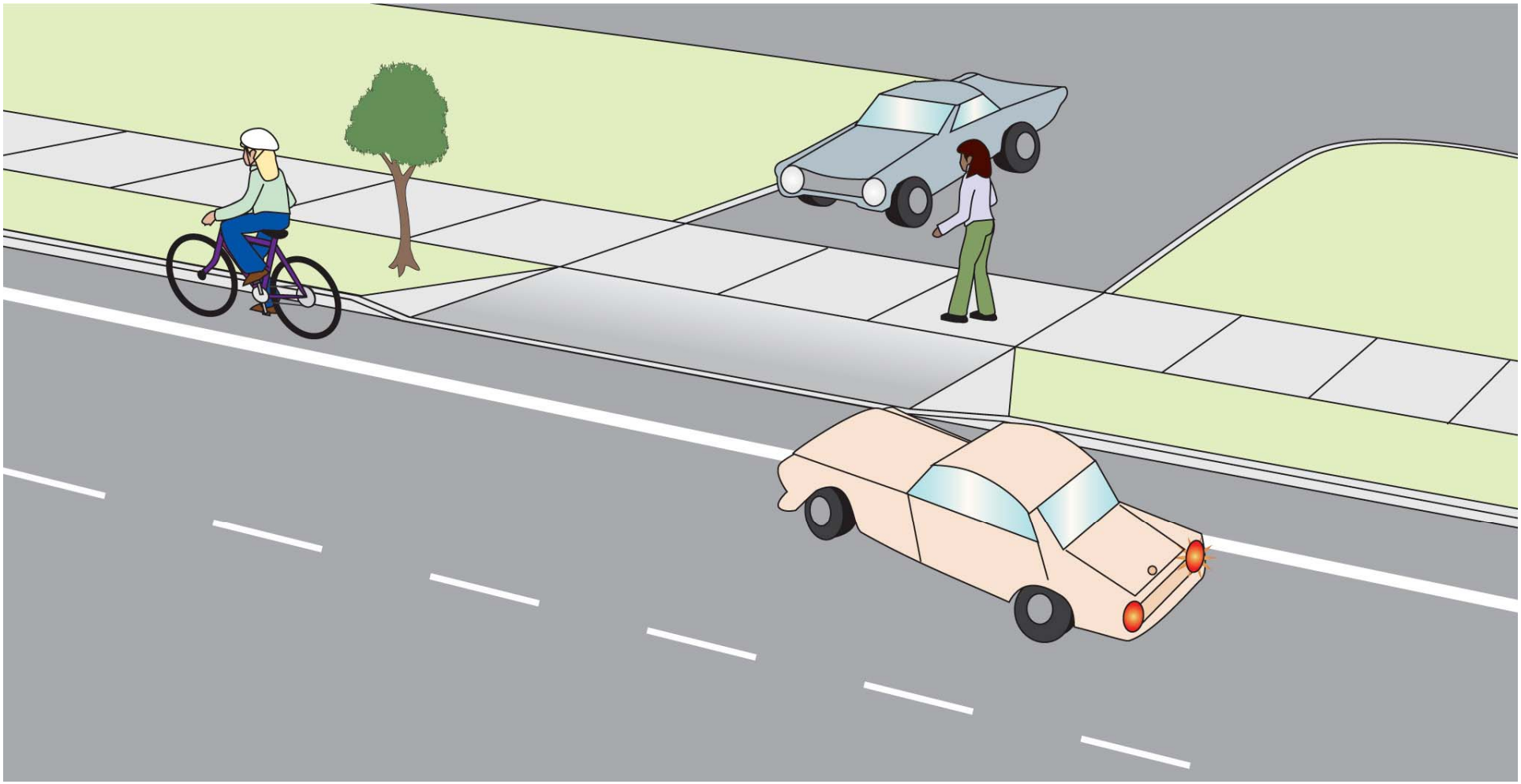
	Boulevard	Avenue	Street
Industrial	Frontage: 18" Pedestrian: 5' Furniture: 5' Curb: 18" Min. Width: 13'	Frontage: 18" Pedestrian: 5' Furniture: 4' Curb: 18" Min. Width: 12'	Frontage: 18" Pedestrian: 5' Furniture: 4' Curb: 18" Min. Width: 12'
Downtown Core / Main Street	Frontage: 30", 8' with cafe seating Pedestrian: 6' Furniture: 5', 6'-8' at bus stops and where large trees are desired Curb: 6" Min. Width: 14'	Frontage: 30", 8' with cafe seating Pedestrian: 6' Furniture: 5', 6'-8' at bus stops and where large trees are desired Curb: 6" Min. Width: 14'	Frontage: 30", 8' with cafe seating Pedestrian: 6' Furniture: 5' Curb: 6" Min. Width: 14'
Transit-Oriented Districts	Frontage: 30" Pedestrian: 8' Furniture: 5', 6'-8' at bus stops and where large trees are desired Curb: 6" Min. Width: 16'	Frontage: 30" Pedestrian: 8' Furniture: 5', 6'-8' at bus stops and where large trees are desired Curb: 6" Min. Width: 16'	Frontage: 18" Pedestrian: 6' Furniture: 5', 6'-8' at bus stops and where large trees are desired Curb: 6" Min. Width: 13'
Office Park	Frontage: 18" Pedestrian: 5' Furniture: 5' Curb: 6" Min. Width: 12'	Frontage: 18" Pedestrian: 5' Furniture: 5' Curb: 6" Min. Width: 12'	Not applicable
Public Facilities	Frontage: 30" Pedestrian: 8' Furniture: 5', 6'-8' at bus stops and where large trees are desired Curb: 6" Min. Width: 16'	Frontage: 30" Pedestrian: 8' Furniture: 5', 6'-8' at bus stops and where large trees are desired Curb: 6" Min. Width: 16'	Frontage: 18" Pedestrian: 6' Furniture: 5', 6'-8' at bus stops and where large trees are desired Curb: 6" Min. Width: 13'

2-50 Driveways

Driveways are the source of most conflicts with motor vehicles on sidewalks



Driveways built like intersections encourage high-speed turns



Driveways built like driveways encourage slow-speed turns

Intersection or Driveway?

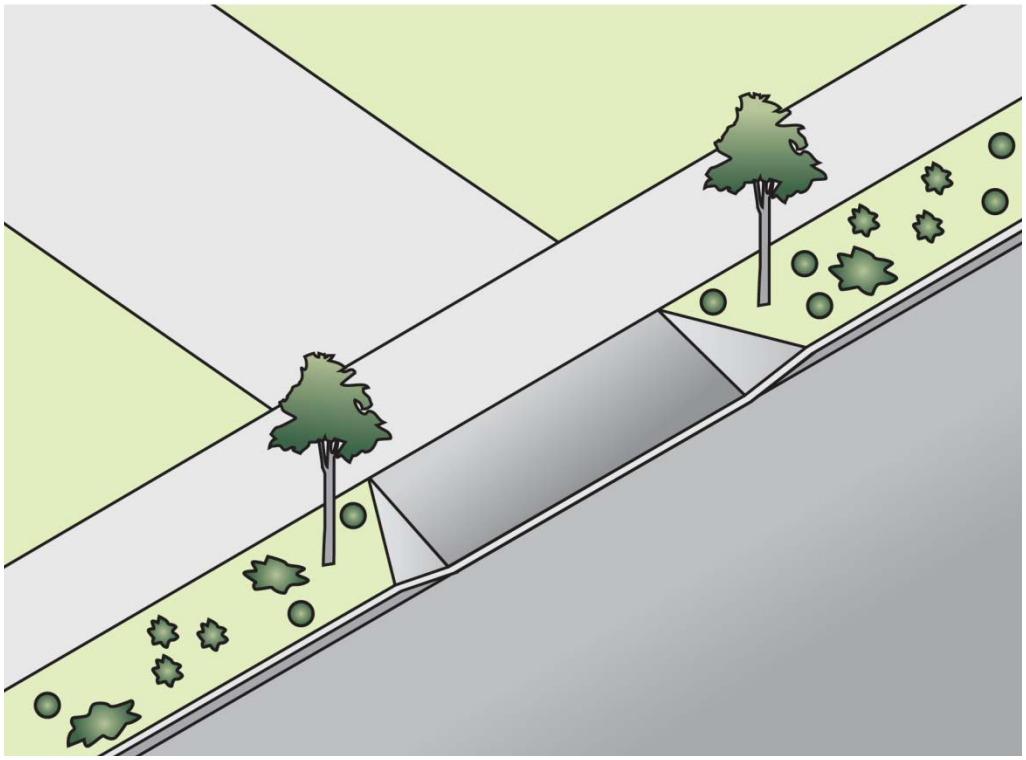
2-54 **Reno NV**

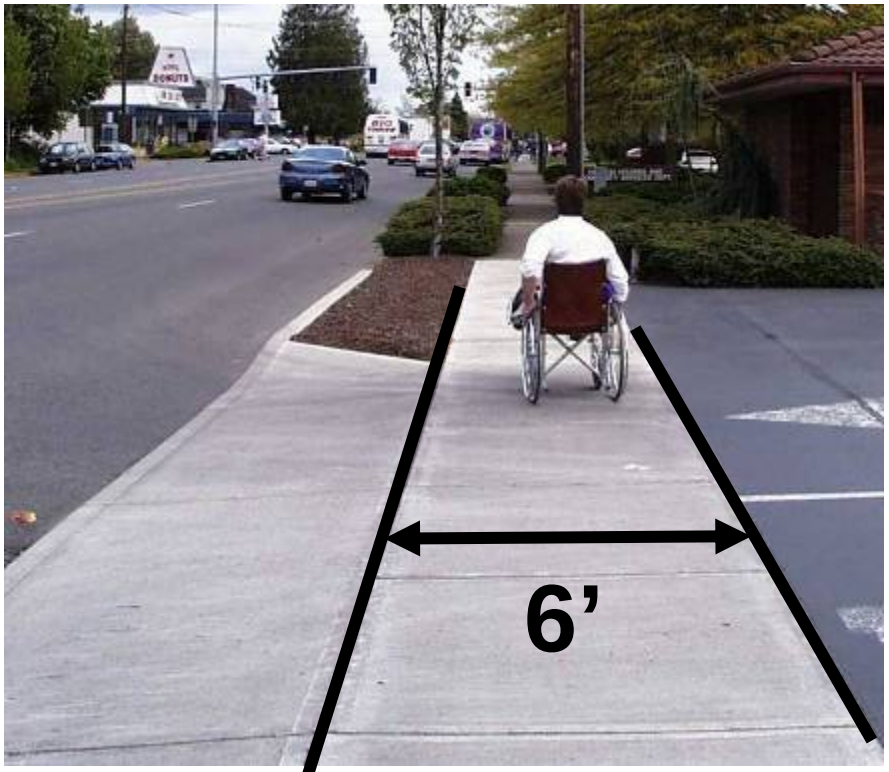
- This driveway was built like an intersection
- Driver exits at high speed, not looking at pedestrians

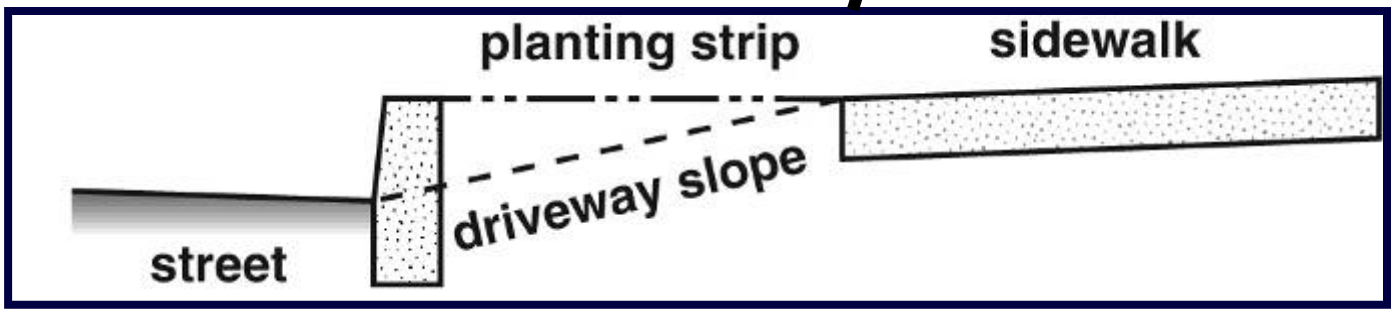
This driveway tells drivers watch for pedestrians

ADA requirements for driveways: minimum pedestrian access route of 3’ (soon to be 4’) at 2% max cross-slope

Easier to maintain level access with separated sidewalks







Without zone system hard to meet ADA

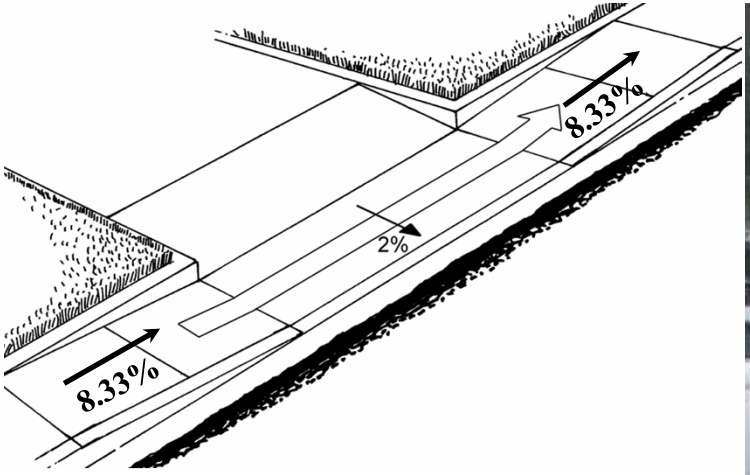
2-58 **Sweet Home OR**

For narrow curbside sidewalks, wrap sidewalk around apron

Driveway Coaster

Most common reason given by wheelchair users using the street

- Driveways are not flat



- Max Ramp Slope 8.33%
- Max Cross Slope 2%

- For narrow curbside sidewalks
- Fully lowered sidewalk

Walking Along the Road – Let's Recap

1. Crash Reduction Factors:

- Rural environments:
  - Paved shoulders reduce ped crashes up to 70%
- Urban environments:
  - Sidewalks reduce ped crashes up to 88%
    - (most sidewalk crashes occur at driveways)

Walking Along the Road – Let's Recap

2. Sidewalk Design: The zone system
   - What are the 4 zones?

1. The curb zone
2. The furniture/planter/buffer zone
3. The pedestrian/walking zone
4. The frontage zone

Walking Along the Road – Let's Recap

3. Sidewalk Design: Key characteristics

How should the walking zone be designed?

- Smooth
- Separated from traffic
- Clear of obstructions
- Level cross-slope (max 2%)
- Wide enough to accommodate expected pedestrian volumes

Walking Along the Road
Learning Outcomes:

You should now be able to:

- Describe the operational and safety benefits of shoulders and sidewalks
- Select appropriate designs for sidewalks

Questions?