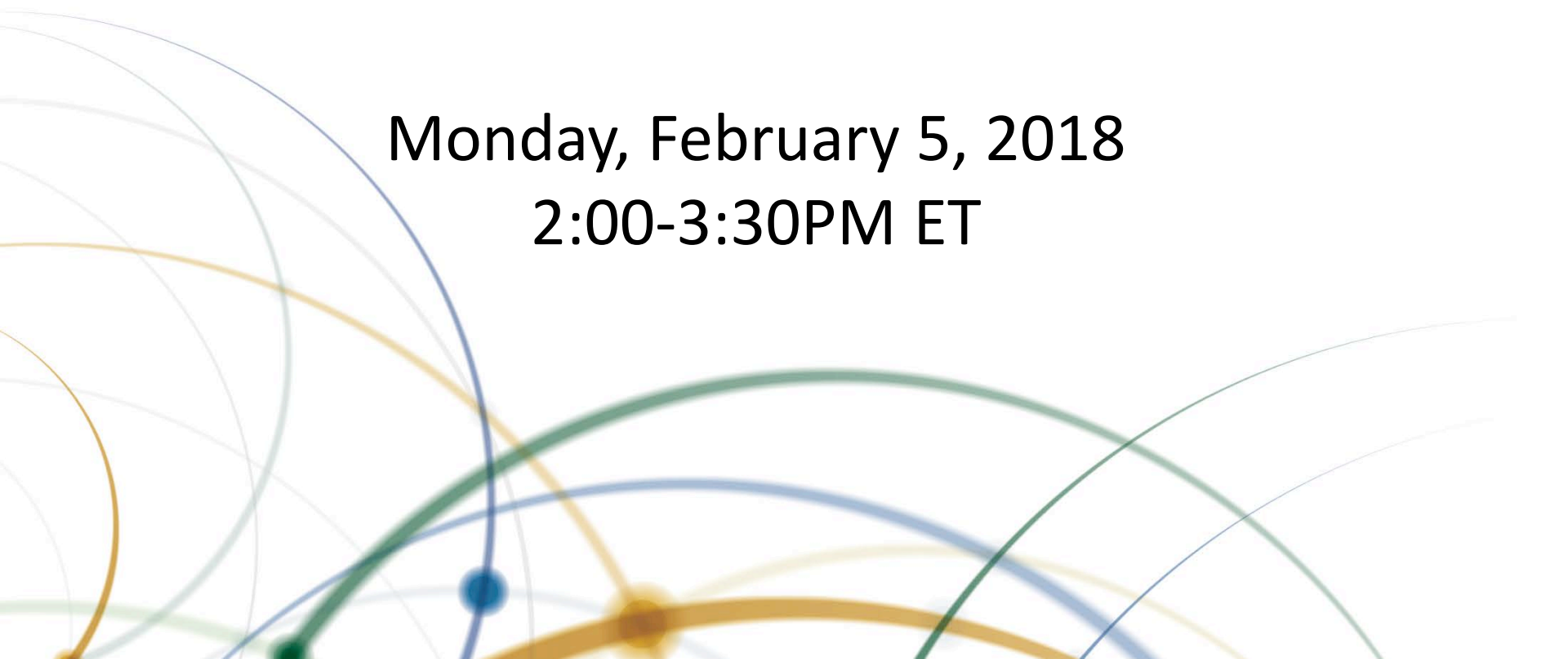


The National Academies of
SCIENCES • ENGINEERING • MEDICINE

TRANSPORTATION RESEARCH BOARD

A New Functional Classification System to Aid Contextual Design

Monday, February 5, 2018
2:00-3:30PM ET



The Transportation Research Board has met the standards and requirements of the Registered Continuing Education Providers Program. Credit earned on completion of this program will be reported to RCEP. A certificate of completion will be issued to participants that have registered and attended the entire session. As such, it does not include content that may be deemed or construed to be an approval or endorsement by RCEP.



REGISTERED CONTINUING EDUCATION PROGRAM




Purpose

Discuss NCHRP Report 855.

Learning Objectives

At the end of this webinar, you will be able to:

- Describe the concepts of the Expanded Functional Classification System
 - Identify required steps for implementing classification
 - Describe design flexibility within the classification
 - Understand how to balance multimodal solutions
- 

NCHRP Report 855: An Expanded Functional Classification System for Highways and Streets

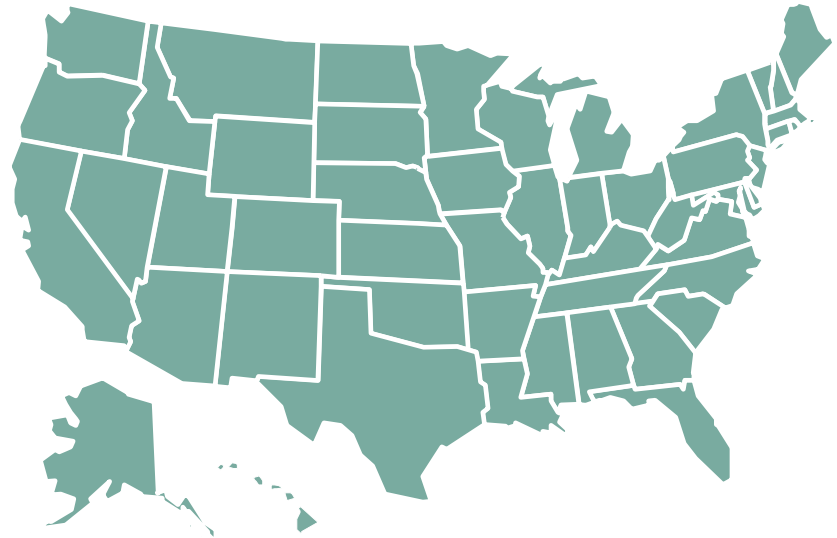
NCHRP Project 15-52



NCHRP is a State-Driven Program

- Sponsored by individual state DOTs who

- Suggest research of national interest
- Serve on oversight panels that guide the research.

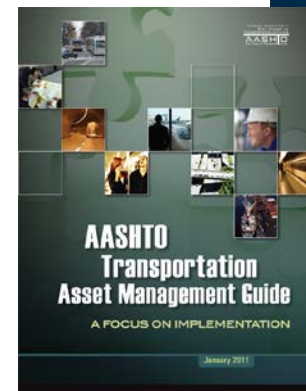
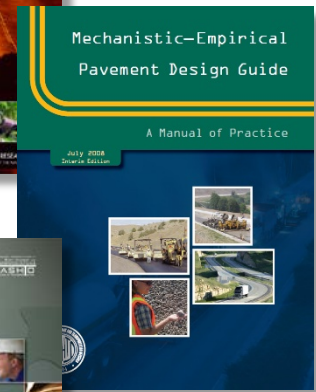
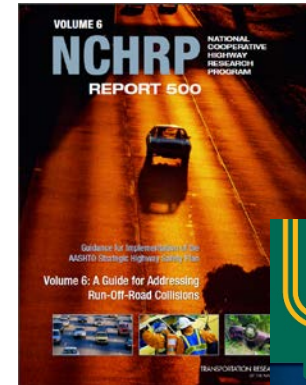


- Administered by TRB in cooperation with the Federal Highway Administration.



Practical, ready-to-use results

- Applied research aimed at state DOT practitioners
- Often become AASHTO standards, specifications, guides, syntheses
- Can be applied in planning, design, construction, operations, maintenance, safety, environment



Today's Speakers

- *Nick Stamatiadis, University of Kentucky*
- *John Donahue, Washington State DOT*
- *Brian Shunk, Pennsylvania DOT*
- *Fred Dock, City of Pasadena, CA*



Implementing the Expanded Functional Classification System at WSDOT

John P Donahue, PE, AICP
Design Analysis and Policy Manager
February 5, 2018

Overview

- Practical solutions is the framework
- The evolution of context and design policy
- Adapting the expanded functional classification
- An example of context and performance

A path forward in a congested world: Practical Solutions

What is Practical Solutions?

- Addressing congestion **within available resources**
- **Creating transportation investments** – rather than just fixing a problem
- **Emphasizing stewardship /state of good repair** – not just delivering projects
- **Operating safely, efficiently, managing demand . . . then adding capacity**

Focusing on . . . the ***Right Investment*** . . . in the ***Right Location*** . . . at the ***Right Time***



A framework for investment decisions

Policy Direction

- RCW 47.04.280
- Results Washington
- **Results WSDOT strategic plan**

Manage Assets

- **Operate and maintain multimodal system** and agency resources to meet performance objectives at the lowest cost

Identify Needs

- **Identify performance targets** for all policy goals
- Understand critical corridors

Assess Alternative Strategies

- Build strategies with partners
- **Consider least cost strategies first**

Refine Solutions

- Integrated scoping
 - **Safety**
 - **Operations**
 - **Demand Management**
- Capital
- Other

Assign Resources

- Investments reviewed across funding programs to **synchronize for best performance**

Develop Funded Solutions

- **Solutions are defined addressing performance gaps (at the lowest cost)**

Implement Solutions

- Implement or construct

Practical Planning

Practical Design

Evolution of Design Policy



Design Manual

M 22-01.13

July 2016

Division 1 – General Information
Division 2 – Hearings, Environmental, and Permits
Division 3 – Project Documentation
Division 4 – Surveying
Division 5 – Right of Way and Access Control
Division 6 – Soils and Paving
Division 7 – Structures
Division 8 – Hydraulics
Division 9 – Roadside Development
Division 10 – Traffic Safety Elements
Division 11 – Practical Design
Division 12 – Geometrics
Division 13 – Intersections and Interchanges
Division 14 – HOV and Transit
Division 15 – Pedestrian and Bicycle Facilities
Division 16 – Roadside Safety Elements
Division 17 – Roadside Facilities

Engineering and Regional Operations

Development Division, Design Office

<https://www.wsdot.wa.gov/Publications/Manuals/M22-01.htm>

Design Policy (prior to 2015)

Design Matrices



Past practice

Project Type ↓	Main Line														
	Horizontal Alignment	Vertical Alignment	Lane Width	Shoulder Width	Lane Transition	On / Off Connection	Median Width	Cross Slope Lane	Cross Slope Shoulder	Fill / Ditch Slopes	Access ^[3]	Clear Zone ^[18]	Sign., Del., Illum., & ITS	Basic Safety	Bike & Ped.
(3-1) Preventative Maintenance															
Preservation															
Roadway															
(3-2) BST								[28]		[28]		[28]	[28]	B	
(3-3) Milling With HMA Inlays								[28]		[28]		[28]	[28]	B	M
(3-4) HMA Overlays								[28]		[28]		[28]	[28]	B	M
(3-5) Replace HMA w/PCCP at I/S			EU/M	EU/M	EU/F			EU/M	EU/M	[28]		[28]	[28]	B	M
Structures															
(3-6) Bridge Replacement	F ^[2]	F ^[2]	F ^[2]	F ^[2]	F	F ^[2]	F ^[2]	F ^[2]	F ^[2]	F ^[2]		F	F		F
(3-7) Bridge Deck Rehab.												[28]	[28]	B	M
Improvements^[16]															
Mobility															
(3-8) Non-Interstate Freeway	F	F	F	F	F	F	F	F	F	F	F	F	F		F
(3-9) Urban	F ^[2]	F ^[2]	F ^[2]	F ^[2]	F	F ^[2]	F ^[2]	F ^[2]	F ^[2]	F ^[2]	F	F	F		F
(3-10) Rural	F ^[2]	F ^[2]	F ^[2]	F ^[2]	F	F ^[2]	F ^[2]	F ^[2]	F ^[2]	F ^[2]	F	F	F		F
(3-11) HOV	F ^[2]	F ^[2]	F ^[2]	F ^[2]	F	F ^[2]	F ^[2]	F ^[2]	F ^[2]	F ^[2]	F	F	F		F
(3-12) Bike/Ped. Connectivity [5]			F ^[2]	F ^[2]											F

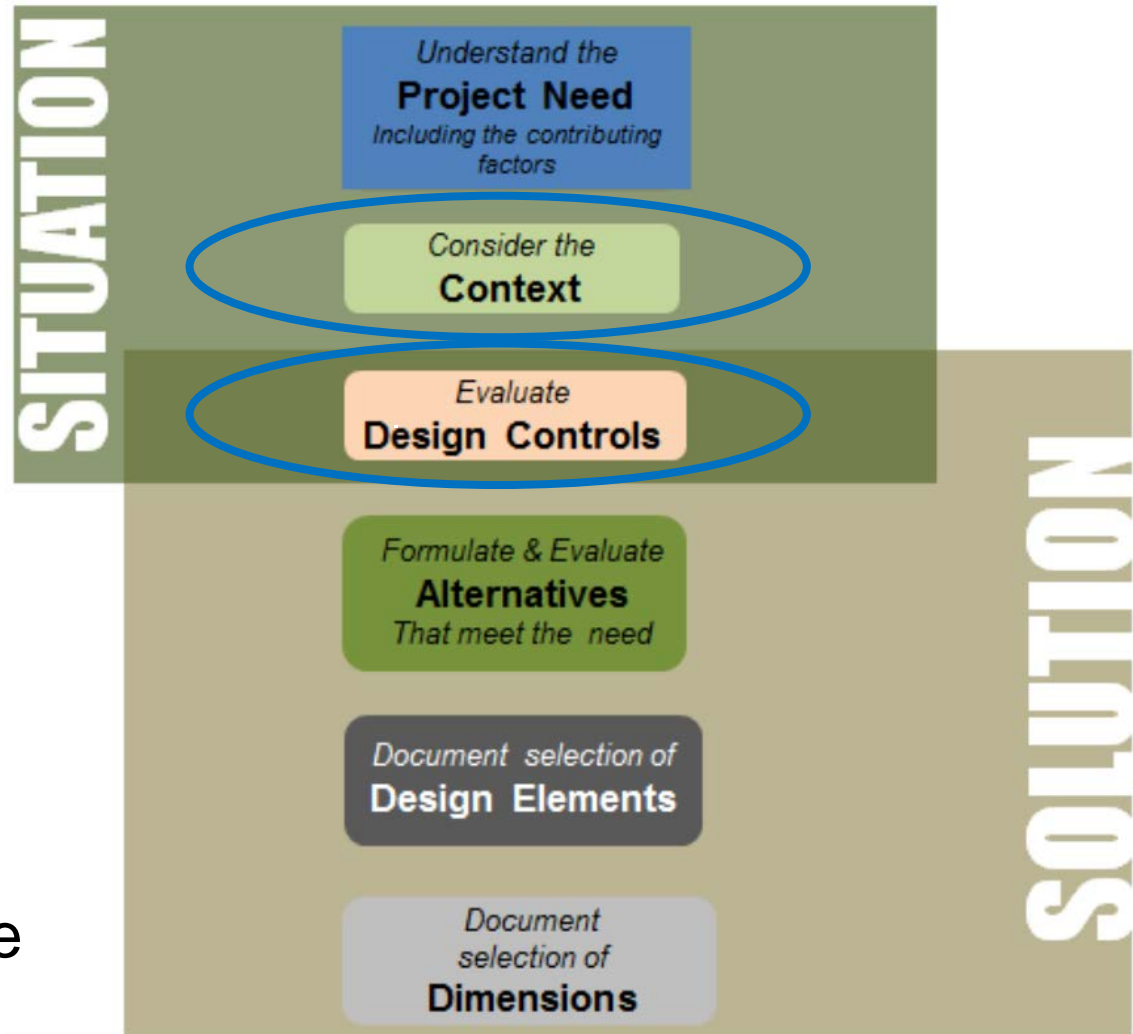
Design Policy (Today)

Basis of Design

Basis of
Design
“Roadmap”



Current Practice



Design Policy (new in 2017)

Basis of Design

Evaluate
Design Controls

Consider the
Context



Using the Expanded Functional Classification at WSDOT

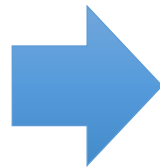
Context

Land use

- Rural
- Suburban
- Urban
- Urban core

Transportation

- Vehicles
- Bicycles
- Pedestrians
- Freight
- Transit



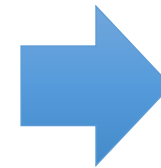
Modes

Design Considerations

- Freight
- Transit

Modal Accommodation

- Vehicles
- Bicycles
- Pedestrians



Design Control

Modal Priority

Using the Expanded Functional Classification

Land use



Using the Expanded Functional Classification

Factor	Criteria
Land Use	Land uses within ½ mi of roadway
Density	Housing units / acre
Density	Jobs / acre
Density	Intersections per sq. mi.
Density	Typical building height
Setback	Typical building setback
Setback	Parking (on street or off street)
Others	Project specific

Context Indicators

Using the Expanded Functional Classification

Transportation

Expressways/Freeways*	Corridors of national importance providing long distance travel
Principal Arterial	Corridors of regional importance connecting large centers of activity
Minor Arterial	Corridors of local importance connecting centers of activity
Collector	Roadways providing connections between arterials and local roads
Local	All other roads

Route types (Vehicles)

Using the Expanded Functional Classification

Transportation

Route Type	Description
Citywide Connector	Links major activity centers Regional bike route Significant commute/ recreational route.
Neighborhood Connector	Feeds citywide connectors Links local activity centers
Local Connector	Feeds higher order connectors Provides internal neighborhood connections Shorter length

Route types (Bicycles)

Using the Expanded Functional Classification





















































Transportation











Route Type	Description
P-1	Pedestrians are or absent
P-2	Low volume – measured in peds per day
P-3	Medium volume – measured in peds per hour
P-4	High volume – could be measured in peds per subhour

Route types (Pedestrians)

Using the Expanded Functional Classification

Modal Accommodation

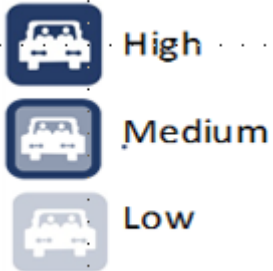
		Land-Use Context			
		Rural	Suburban	Urban	Urban Core
Roadway Type	Freeways				
	Principal Arterial	  	  	  	  
	Minor Arterial	  	  	  	  
	Collector	  	  	  	  
	Local	  	  	  	  

Motor Vehicles Incl. Freight		Bicycles		Pedestrians		 Transit compatibility not shown because it varies by route (compatibility can't be determined based on roadway type and land-use context)
 High		 High		 High		
 Medium		 Medium		 Medium		
 Low		 Low		 Low		

The “Initial” Modal Accommodation Level

Using the Expanded Functional Classification

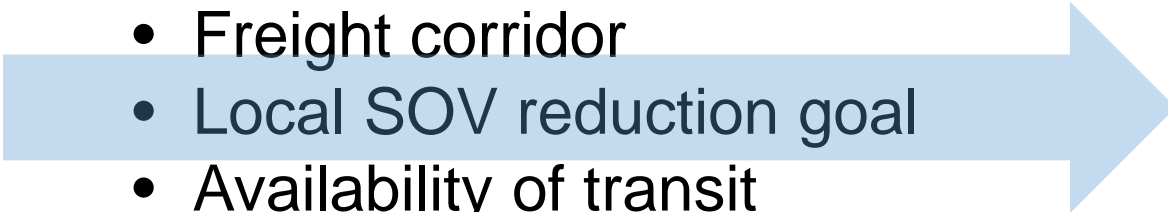
Modal Accommodation



Adjusting the Vehicle Accommodation Level

- Traffic speed
- Mobility measure (LOS)
- Freight corridor
- Local SOV reduction goal
- Availability of transit
- Presence of bikes and peds
- Other

Initial

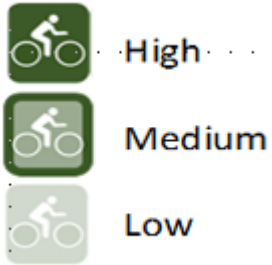


Final

Factors affecting design

Using the Expanded Functional Classification

Modal Accommodation



Adjusting the Bicycle Accommodation Level (Final)

- Bicycle planning
- Destinations
- Transit stops
- Alternative routes
- Vehicle speed
- Truck/Vehicle/Bike volumes
- Other

Initial

Final

Factors affecting design

Using the Expanded Functional Classification

Modal Accommodation



High



Medium

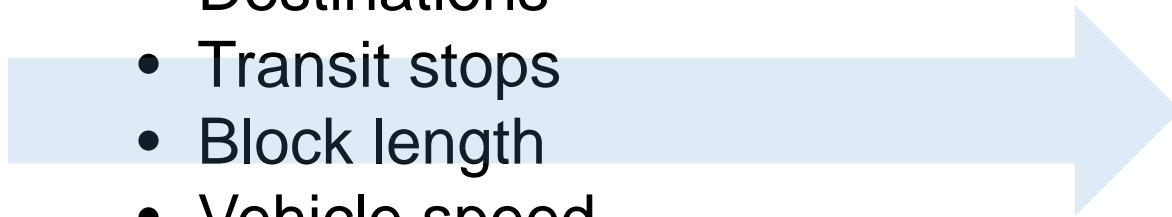


Low

Adjusting the Pedestrian Accommodation Level (Final)

- Pedestrian planning
- Destinations
- Transit stops
- Block length
- Vehicle speed
- Pedestrian volumes
- Other

Initial



Final

Factors affecting design

Basis of Design

Section 2) Context	
Land Use Context (existing and future)	
Community Engagement	
Transportation Context (existing and future)	
Major Environmental Considerations (See the Environmental Review Summary for details)	

Context in 2015

Basis of Design

Section 2) Context						
In consultation with Region Planning Office						
Roadway _____ MP _____ to MP _____						
<i>[Duplicate this section as necessary to reflect 1) future conditions and 2) applicable milepost ranges]</i>						
Land Use Context	Freeway	<i>For freeways, document the urban/rural designation as listed on the State Route Log</i> <input type="checkbox"/> Rural <input type="checkbox"/> Urban <input type="checkbox"/> Interstate <input type="checkbox"/> Non-Interstate				
	Non-Freeway	<input type="checkbox"/> Rural <input type="checkbox"/> Suburban <input type="checkbox"/> Urban <input type="checkbox"/> <u>Urban Core</u>				
Transportation Context	Roadway Type (Final)	<input type="checkbox"/> Freeway <input type="checkbox"/> Principal Arterial <input type="checkbox"/> Minor Arterial <input type="checkbox"/> Collector <input type="checkbox"/> Local				
	Bicycle Route Type	<input type="checkbox"/> Citywide Connector <input type="checkbox"/> Neighborhood Connector <input type="checkbox"/> Local Connector				
	Pedestrian Route Type	<input type="checkbox"/> P-1 <i>Rare Use</i>	<input type="checkbox"/> P-2 <i>Low Volume</i>	<input type="checkbox"/> P-3 <i>Medium Volume</i>	<input type="checkbox"/> P-4 <i>High Volume</i>	
	Freight Use	<input type="checkbox"/> T-1 <i>>10M tons/yr.</i>	<input type="checkbox"/> T-2 <i>4M to 10M tons/yr.</i>	<input type="checkbox"/> T-3 <i>0.30 to 4M tons/yr.</i>	<input type="checkbox"/> T-4 <i>0.10M to 0.30 tons/yr.</i>	<input type="checkbox"/> T-5 <i>At least 20,000 tons in 60 days and less than 100,000/yr.</i>
	General	<i>Coordinate with Region Planning Office. Describe any special design considerations that apply.</i>				
Transit Use	General	<i>Coordinate with Region Planning Office. Describe any special design considerations that apply.</i>				

Context in 2017

Context and Modal Accommodation Report

Context and Modal Accommodation Report Version 2.0 (12/31/2017)

(For use in conjunction with a Basis of Design form on non-freeway projects)

Project Title:

PIN:

Date:

Planning Document Summary	
Has a Corridor Sketch been completed for the roadway(s)?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Notes:	
List any applicable planning and environmental reports or studies (optional: highlight major considerations):	

General Project Information						
Route Information	SR	NHS (Y/N)	Functional Class	Current Posted Speed	Truck %	Current ADT

<http://wsdot.wa.gov/design/support.htm>

Context and Modal Accommodation Report

Indicator	Relevance	Rural	Suburban	Urban/Town	Urban Core	Source (Existing)	Source (Future)
Land Use	Within ½ mile of roadway	Agricultural uses with some isolated residential and commercial Existing <input type="checkbox"/> Future <input type="checkbox"/>	Single uses (divided into residential, commercial, institutional or industrial uses) Existing <input type="checkbox"/> Future <input type="checkbox"/>	Mixed-uses (blends 2+ residential, commercial, institutional and/or industrial uses) Existing <input type="checkbox"/> Future <input type="checkbox"/>	Mixed uses except industrial and agriculture Existing <input type="checkbox"/> Future <input type="checkbox"/>	Aerial Photos	City or County Comprehensive Plan, Zoning & Land Use Designations
Housing Units/Acre	Polygons adjacent to roadway	< 1 unit/acre Existing <input type="checkbox"/> Future <input type="checkbox"/>	1-4 units/acre Existing <input type="checkbox"/> Future <input type="checkbox"/>	4-15 units/acre Existing <input type="checkbox"/> Future <input type="checkbox"/>	15+ units/acre Existing <input type="checkbox"/> Future <input type="checkbox"/>	EPA Smart Location Database	City or County Comprehensive Plan
Jobs/Acre	Polygons adjacent to roadway	0-1 jobs/acre Existing <input type="checkbox"/> Future <input type="checkbox"/>	1-10 jobs/acre Existing <input type="checkbox"/> Future <input type="checkbox"/>	10-50 jobs/acre Existing <input type="checkbox"/> Future <input type="checkbox"/>	50+ jobs/acre Existing <input type="checkbox"/> Future <input type="checkbox"/>	EPA Smart Location Database	City or County Comprehensive Plan

<http://wsdot.wa.gov/design/support.htm>

Context Documentation Workflow

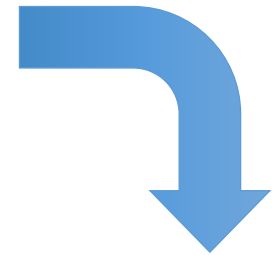
*Basis of
Design Task*

Context /
Modal Priority
needed



SME work

Context and Modal
Accommodation
Report (CMAR)

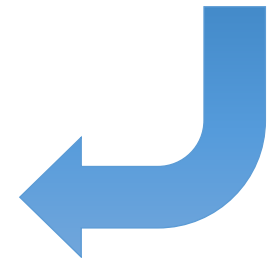


CMAR Rollup

Basis of Design
Section 2 and 3

Concurrence

Project Advisory Team



Basis of Design

Roles and Responsibility Matrix

		Analysis					
Role	Responsibility	Contributing Factors	Modal Priority	Baseline Need	Contextual Need	Alternatives Identification	Alternatives Analysis
Lead	Responsible for ensuring that the general project information and BOD worksheet is completed, including obtaining the required signatures.	X	X	X	X	X	X
Traffic	Responsible for assessment of traffic operations and safety		X	X	X	X	X
Design	Responsible for identifying existing roadway characteristics and geometrics	X		X	X	X	X
Environmental	Responsible for identifying environmental and cultural issues	X				X	X
Planning	Responsible for providing information on existing plans and studies as well as Contextual information on and near the project.		X		X	X	
Stakeholder	Provides feedback and may contribute to the identification of alternatives		X			X	

*Depending on the project, the Bridge Office, Maintenance, Public Transportation, Active Transportation, Ferries, Freight and other agencies or divisions may play an active role in participating in identifying modal priority, identification in alternatives, and alternatives criteria.

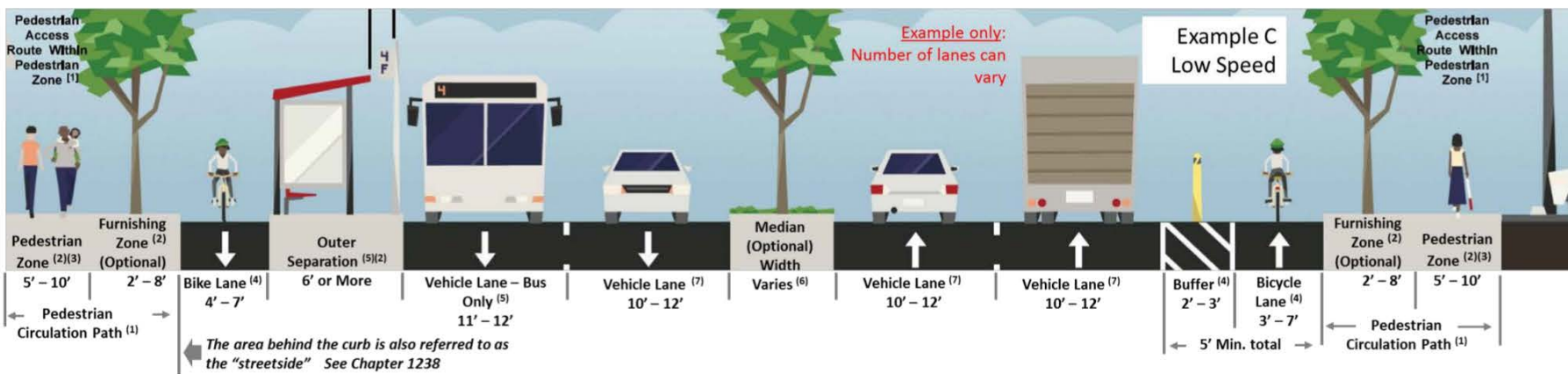
Example: Basis of Design roles

Using the Expanded Functional Classification

Design Policy Highlights

- Context and modal priority has been updated
- Data sources and tools (GIS and local plans)
- Context and Modal Accommodation Report template
- Tools/guidance are integrated with Basis of Design
- Training underway
- Reviewing additions/changes for 2018

Supporting Multimodal Design



Modal Accommodation and Priority

Implementing the Expanded Functional Classification System at WSDOT



John P Donahue, WSDOT Development Division
Design Analysis and Policy Manager (DonahJo@wsdot.wa.gov)

Karena Houser, WSDOT Multimodal Planning Division
Planning Innovations Manager (HouseK@wsdot.wa.gov)

Kyle Miller, WSDOT Multimodal Planning Division
Transportation Planning Specialist (MilleK@wsdot.wa.gov)



NCHRP 15-52

Development of a Context Sensitive
Functional Classification System for
More Flexibility in Geometric Design

Nikiforos Stamatiadis
University of Kentucky

Research Objective

- ◆ Review traditional functional classification scheme
- ◆ Revise functional classification scheme to facilitate contextual design
- ◆ Examine potential impacts of revised scheme on other areas

Existing Classification

Shortcomings

- ◆ Lack of
 - Land use recognition
 - Balancing modal needs
 - Recognition of suburban context
 - Recognition of rural community Main Streets
- ◆ Encouragement of generalized design solutions

New Classification Objectives

◆ Primary

- Expand context definition beyond urban and rural
- Allow for multi-modal prioritization/ accommodation

◆ Secondary

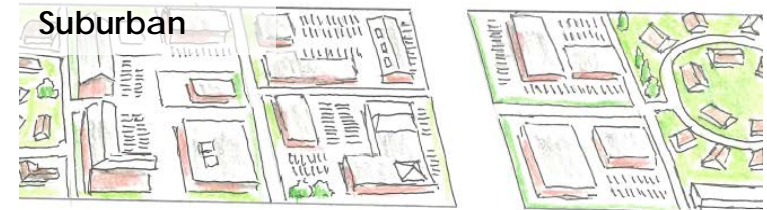
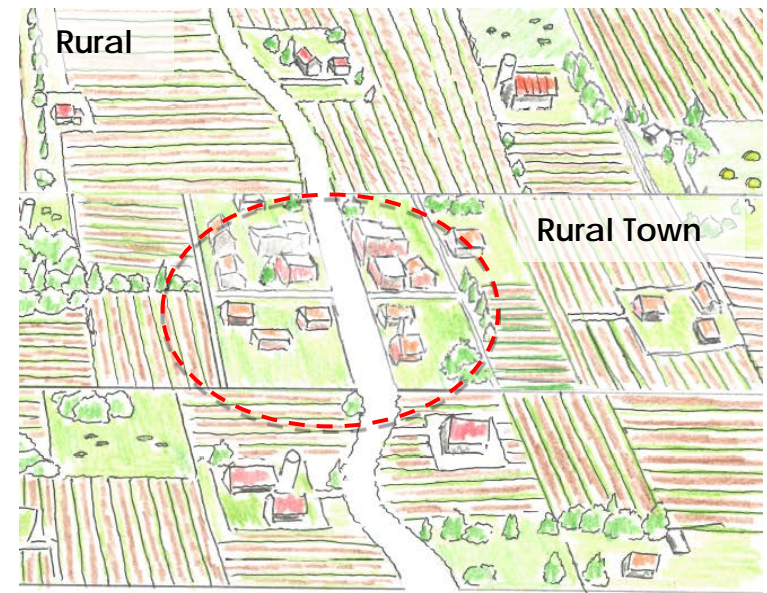
- Consider function in the overall network
- Ease of use
- Relate directly to FHWA/AASHTO functional classification

What Should FCS Determine?

- ◆ Roadway network needs
- ◆ Contextual constraints
- ◆ User accommodations
 - Vehicular speeds and mobility
 - Bicycle separation
 - Pedestrian activity
 - Special use needs (Transit/Freight)

Context Types

- ◆ Five contexts
- ◆ Defining elements
 - Density
 - Land use
 - Building setbacks



Roadway Types

- ◆ Existing terms
- ◆ Defining element
 - Network function
 - Connectivity

Expressways/Freeways*	Corridors of national importance providing long distance travel
Principal Arterial	Corridors of regional importance connecting large centers of activity
Minor Arterial	Corridors of local importance connecting centers of activity
Collector	Roadways providing connections between arterials and local roads
Local	All other roads

Bicycle Networks

◆ Network connectivity

Citywide Connector	Citywide/Regional connections or connections to major activity centers or regional bike routes stretching over several miles attracting high bike volumes
Neighborhood Connector	Neighborhood or sub-area connections allowing access to higher order facilities or local activity centers
Local Connector	Local connections of short length providing internal connections to neighborhoods or connect to higher order facilities

Pedestrian Networks

- ◆ Individual area context
- ◆ Localized facilities
 - Urban areas across contexts
 - Suburban areas

Expanded-FCS Matrix

Context \ Roadway	Rural	Rural Town	Suburban	Urban	Urban Core
Principal Arterial	DRIVER BICYCLIST PEDESTRIAN				
Minor Arterial					
Collector					
Local					

Driver Accommodation

◆ Speed

- Low
- Medium
- High

◆ Access levels

- Low
- Medium
- High

◆ Mobility levels

- Low
- Medium
- High

Expanded-FCS Driver Accommodation

Context Roadway	Rural
Principal Arterial	H speed H mobility- L access
Minor Arterial	H speed H mobility- M access
Collector	M speed M mobility- M access
Local	M speed M mobility- M access

↑
Target Speed

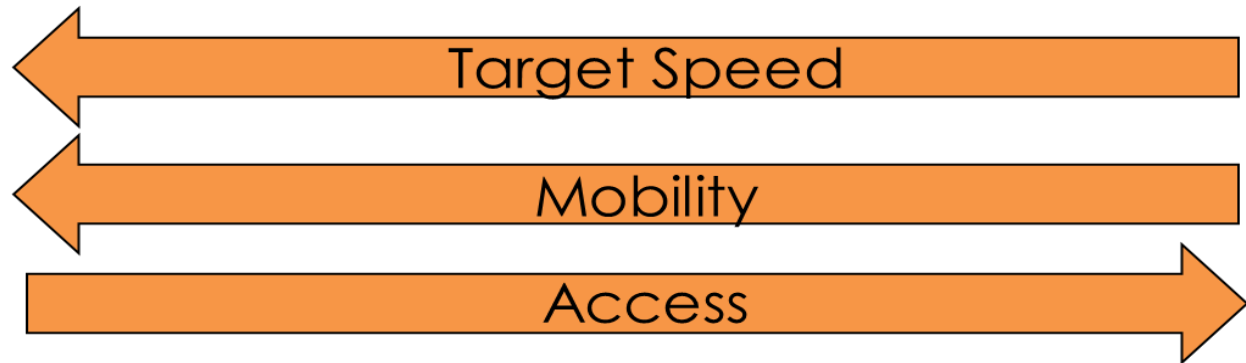
↑
Mobility

↓
Access

Speed, Mobility and
Accessibility levels: H: High;
M: Medium; L: Low

Expanded-FCS Driver Accommodation

Context	Rural	Rural Town	Suburban	Urban	Urban Core
Roadway					
Principal Arterial	H speed H mobility- L access	L/M speed M mobility- H access	M/H speed M mobility- M access	L/M speed M mobility- M access	L speed M mobility- M access



Speed, Mobility and Accessibility levels: H: High; M: Medium; L: Low

Bicyclist Accommodation

◆ Separation

- L: Low—shared use
- M: Medium—dedicated space
- H: High—separated facility

Pedestrian Accommodation

◆ Traffic













- P1 (Rare/Occasional)
- P2 (Low)
- P3 (Medium)
- P4 (High)

◆ Sidewalk width

- *
- Minimum
- Wide
- Enhanced

◆ Separation

Expanded-FCS Matrix

Context		User	Rural	Rural Town	Suburban	Urban	Urban Core
Roadway							
Principal Arterial		H speed H mobility-L access	L/M speed M mobility-H access	M/H speed M mobility-M access	L/M speed M mobility-M access	L speed M mobility-M access	
		LC: L separation; NC: M separation; CC: H separation	LC: L separation; NC, CC: M separation	LC: L separation; NC: M separation; CC: H separation	LC: L separation; NC: M/H separation; CC: H separation	LC: L separation; NC, CC: M separation	
		P1: *; P2: Min; P3, P4: Wide	P2: Min; P3: Wide ; P4:Enhanced	P1: *; P2: Min;P3: Wide; P4: Wide	P2: Min; P3: Wide; P4: Enhanced	P3: Wide; P4:Enhanced	
Minor Arterial		H speed H mobility-M access	L/M speed M mobility-H access	M speed M mobility-M access	L/M speed M mobility-M/H access	L speed M mobility-M/H access	
		LC: L separation; NC: M separation; CC: H separation	LC: L separation; NC, CC: M separation	LC: L separation; NC: M separation; CC: H separation	LC: L separation; NC, CC: M separation	LC: L separation; NC, CC: M separation	
		P1, P2: Min P3, P4: Wide	P2: Min; P3: Wide ; P4:Enhanced	P1: *; P2: Min;P3: Wide; P4: Wide	P2: Min; P3: Wide; P4: Enhanced	P3: Wide; P4:Enhanced	
Collector		M speed M mobility-M access	L speed M mobility-H access	M speed M mobility-H access	L speed M mobility-H access	L speed M mobility-H access	
		LC: L separation; NC, CC: M separation	LC, NC: L separation; CC: M separation	LC: L separation; NC, CC: M separation	LC: L separation; NC, CC: M separation	LC, NC: L separation; CC: M separation	
		P1, P2: Min; P3, P4: Wide	P2: Min; P3: Wide ; P4:Enhanced	P1: *; P2: Min;P3: Wide; P4: Wide	P2: Min; P3: Wide; P4: Enhanced	P3: Wide; P4:Enhanced	
Local		M speed M mobility-M access	L speed M mobility-H access	L speed L mobility-H access	L speed L mobility-H access	L speed L mobility-H access	
		LC, NC, CC: L separation	LC, NC, CC: L separation	LC, NC, CC: L separation	LC, NC, CC: L separation	LC, NC, CC: L separation;	
		P1, P2: Min; P3, P4: Wide	P2: Min; P3: Wide ; P4:Enhanced	P1: *; P2: Min;P3: Wide; P4: Wide	P2: Min; P3: Wide; P4: Enhanced	P3: Wide; P4:Enhanced	

Speed, Mobility, Accessibility and Separation levels: H: High; M: Medium; L: Low




Bicycle Connectors: LC: Local; NC: Neighborhood; CC: Citywide

Pedestrian traffic levels: P1: rare/occasional; P2: low; P3: medium; P4: high

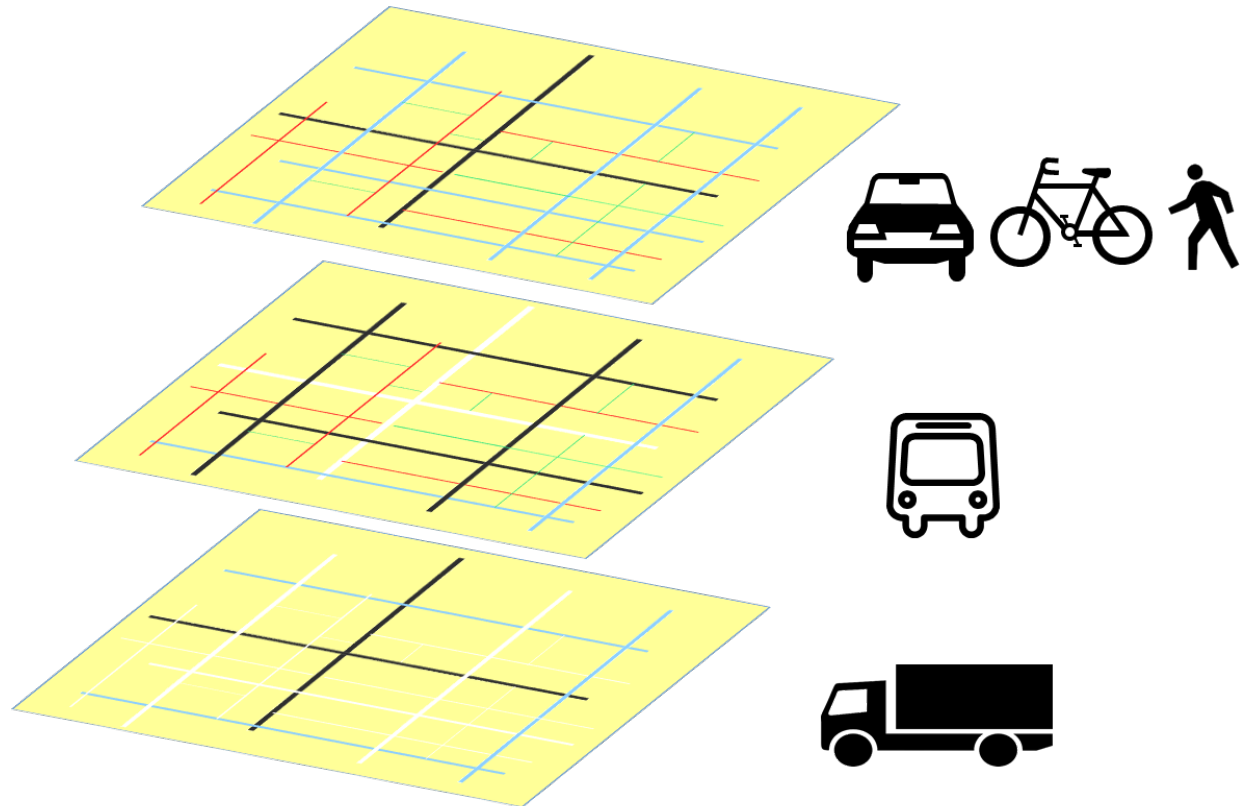
Pedestrian facility width: *: site specific considerations; Min: minimum; Wide: greater than minimum; Enhanced: wide for large congregating pedestrian groups

Pedestrian facility separation should be considered in conjunction with driver target speeds

Expanded-FCS Composite Cell

Context Roadway	User	Suburban
Minor Arterial	  	<p>M speed M mobility-M access</p> <p>LC: L separation; NC: M separation; CC: H separation</p> <p>P1 *; P2: Min; P3: Wide; P4: Wide</p>

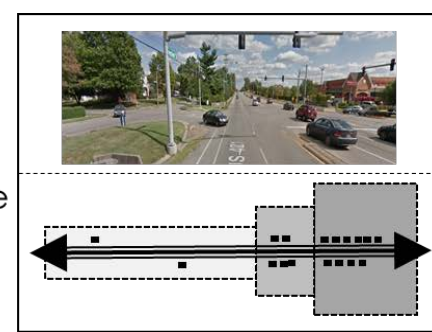
Overlays



- Prin. Arterials
- Minor Arterials
- Collectors
- Locals

Application

Define context and roadway type



Identify users



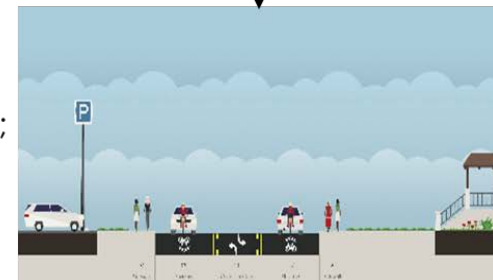
Identify potential user ranges

Context \ Roadway	Rural	Rural Town	Suburban	Urban	Urban Core
Principal Arterial	DRIVER BICYCLIST PEDESTRIAN				
Minor Arterial					
Collector					
Local					

Identify overlays



Develop purpose & need; cross section alternatives

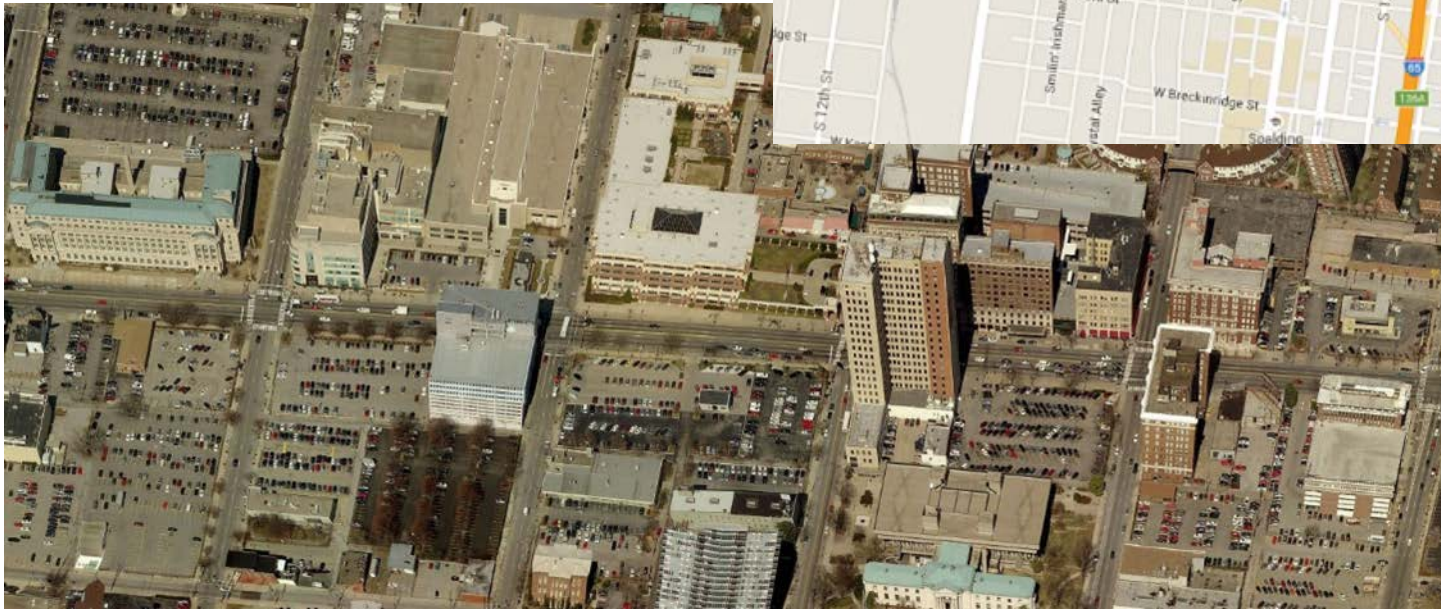
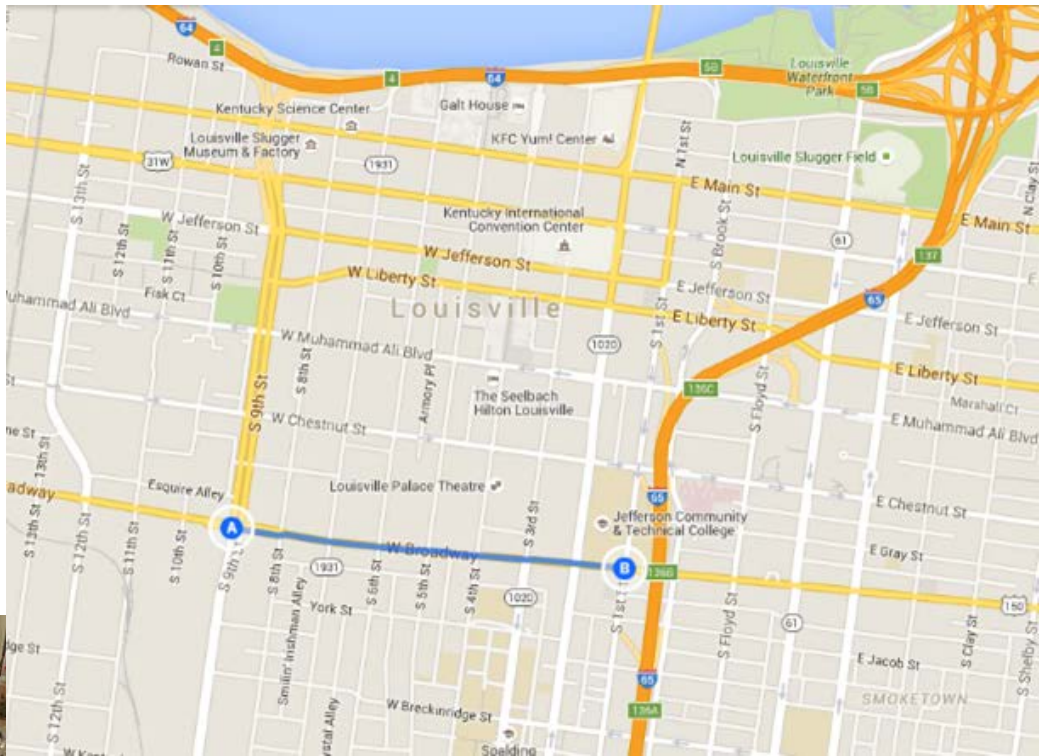


“While it is easily understood that all users must be accommodated within the transportation system, all roads cannot be all things to all people.”

Design Considerations and Interactions

- ◆ Caution regarding use of paired minimum design elements
- ◆ Evaluate alternate routes
- ◆ Lower target speeds/mobility

Case Study - Louisville, KY



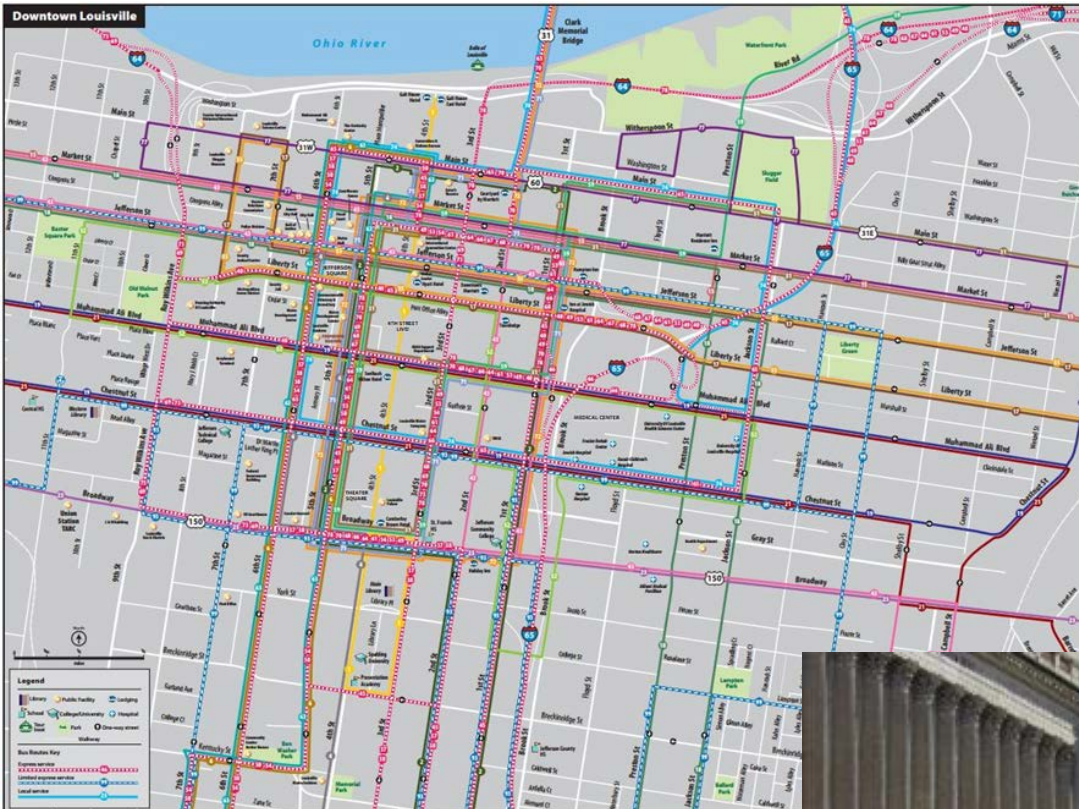


Milepoint	Density	Land use	Setbacks	Expanded FCS
0.0-0.73	High density, multistory and high-rise buildings; highest density within the corridor	Commercial, institutional (court houses and government offices), and residential uses; off-street parking and parking structures	Small setbacks with wide sidewalks and enhanced pedestrian facilities (benches, street furniture and pedestrian plazas)	Urban Core





Pedestrian Activity Areas on W. Broadway

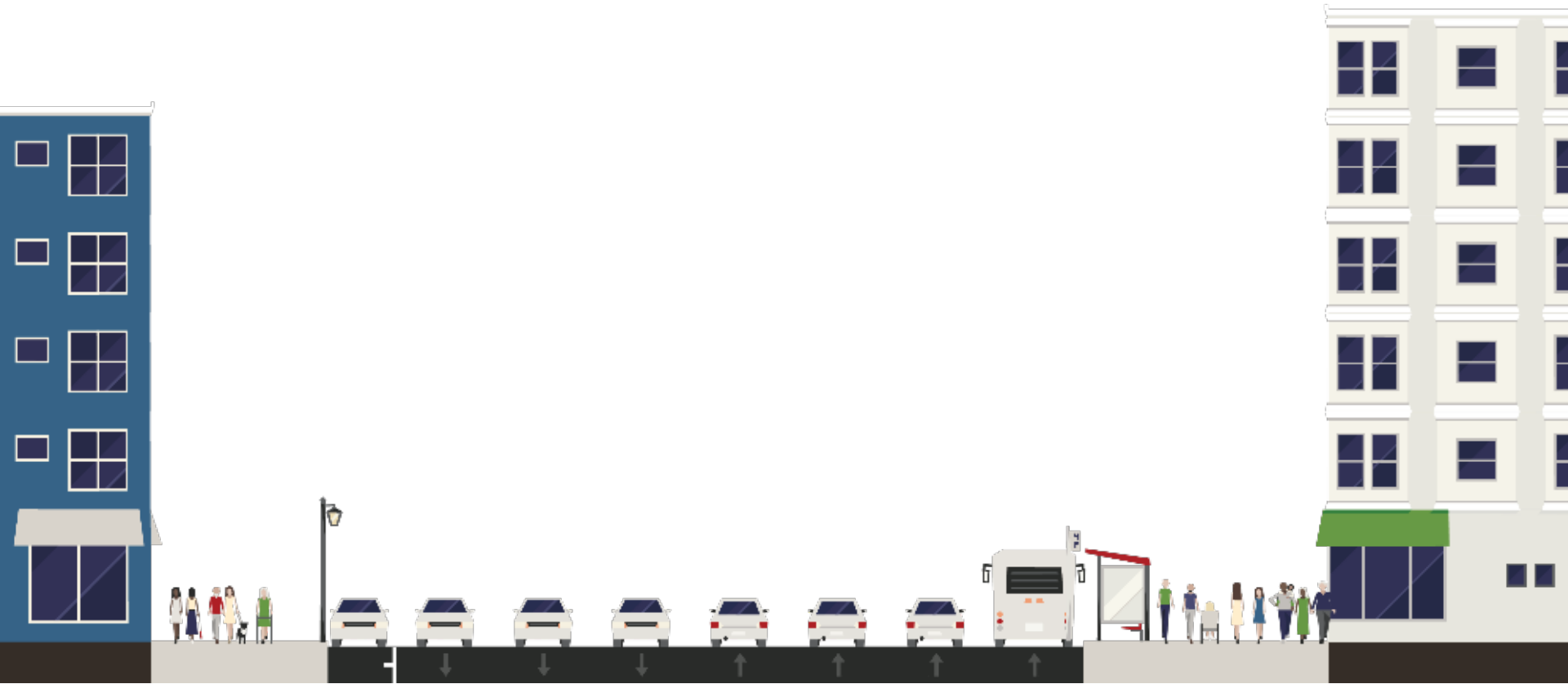


Bus routes

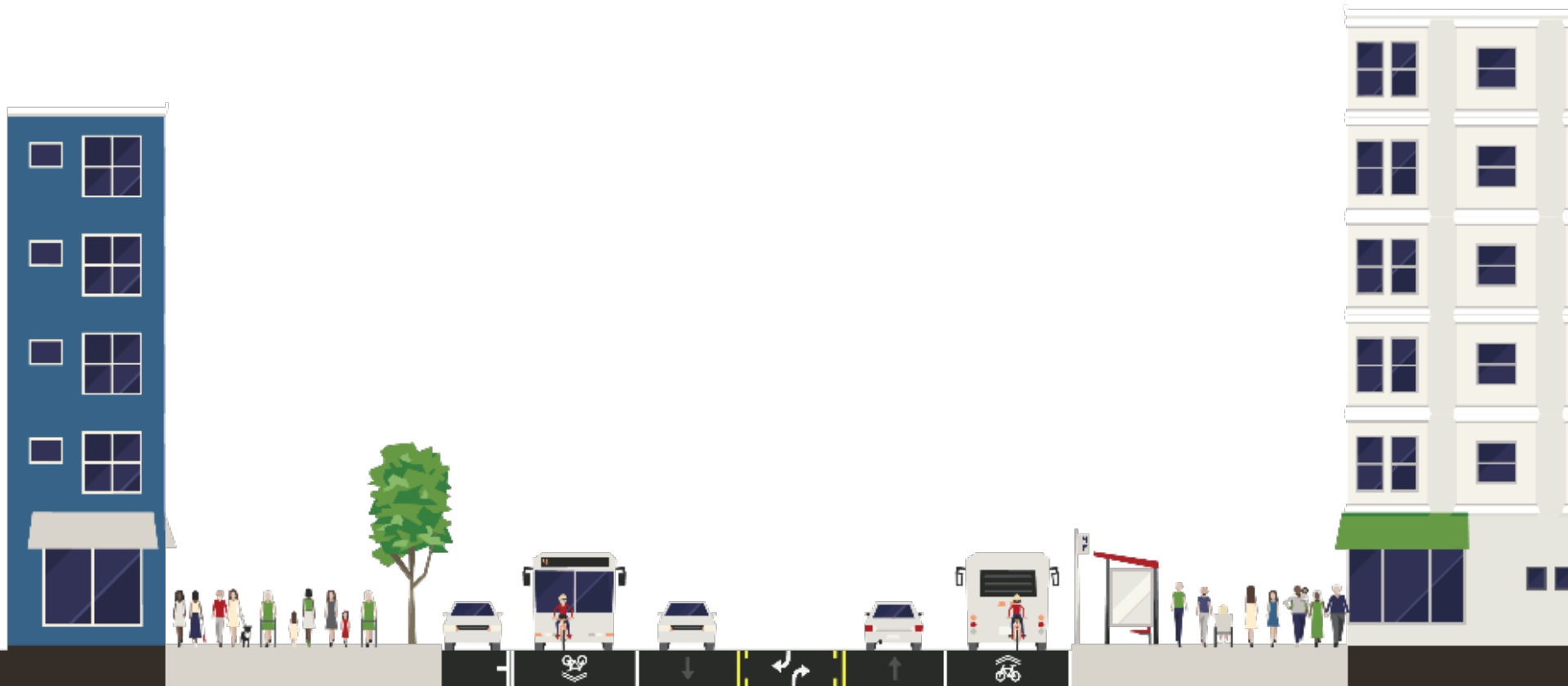
Truck route



Existing Cross Section



Expanded FCS Cross Section



Status

- ◆ Web document (NCHRP 855)
- ◆ Green Book update
 - Context concepts
 - Discussion Chapter 1
- ◆ Pilot state implementation
- ◆ Other guides
 - ITE CSS Practitioner's Guide
 - FL DOT Complete Streets Handbook

Questions

◆ Nick.Stamatiadis@uky.edu



TRB Webinar: A New Functional Classification System to Aid Contextual Design

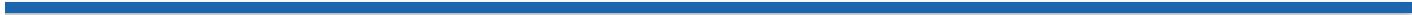
Pennsylvania's Approach to Contextual Integration



February 5, 2018



EXPANDED FUNCTIONAL CLASSIFICATION SYSTEM
UNDERSTANDING THE CONCEPT





What Does an Arterial Look Like?



Photo courtesy of STUDIO | BRYAN HANES

One
Size
Fits All



Understanding the Concept

- The Concept - Context Based Multimodal Approach
- Requires **understanding of the function of the roadway** within its **current and expected future context** and the **needs of the potential roadway users**.





PennDOT's Context Based Design Goal

Safety, Access, and
Mobility

Livability and Context
-preserving scenic,
aesthetic, historic,
and environmentally
sensitive areas



Enhance the Quality of
Life for Pennsylvania
Communities



PennDOT's CSS History



- Discussed:
 - A collaborative project development process
 - Community Involvement
 - Flexibility in Design
 - Project Implementation & Network Maintenance and Operation
 - Safety and Risk Management
- Guide Book and Statewide Training in 2008

A large, light blue, stylized "CSS" logo in the background.

CONTEXT SENSITIVE SOLUTIONS

A Training Course

for Pennsylvania Department of Transportation

PENNDOT

Prepared by Johnson, Mirmiran & Thompson, McCormick, Taylor & Associates, Inc. and Vollmer Associates LLP

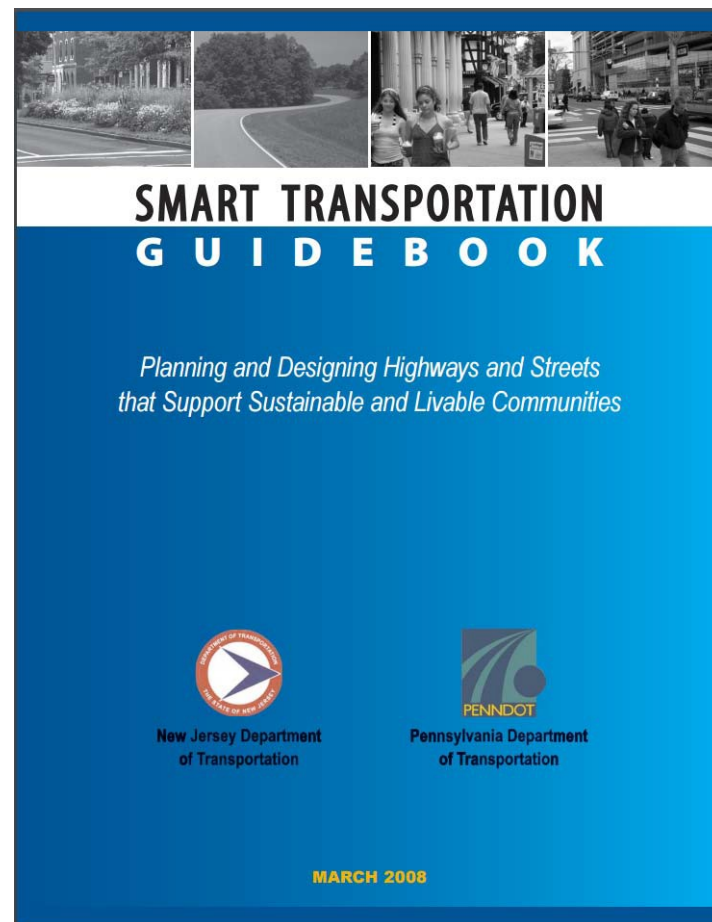
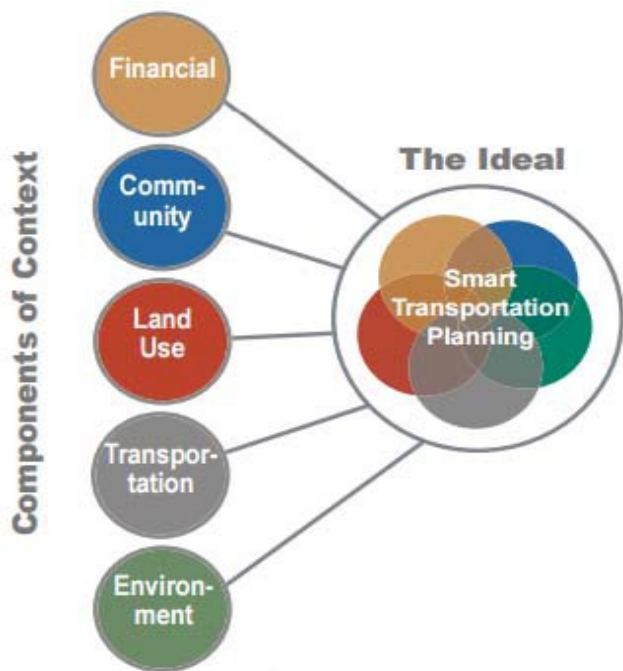
Sponsored by Pennsylvania Department of Transportation



PennDOT's CSS History



- Published 2008
- Integrates planning and design of streets to foster sustainable and livable communities

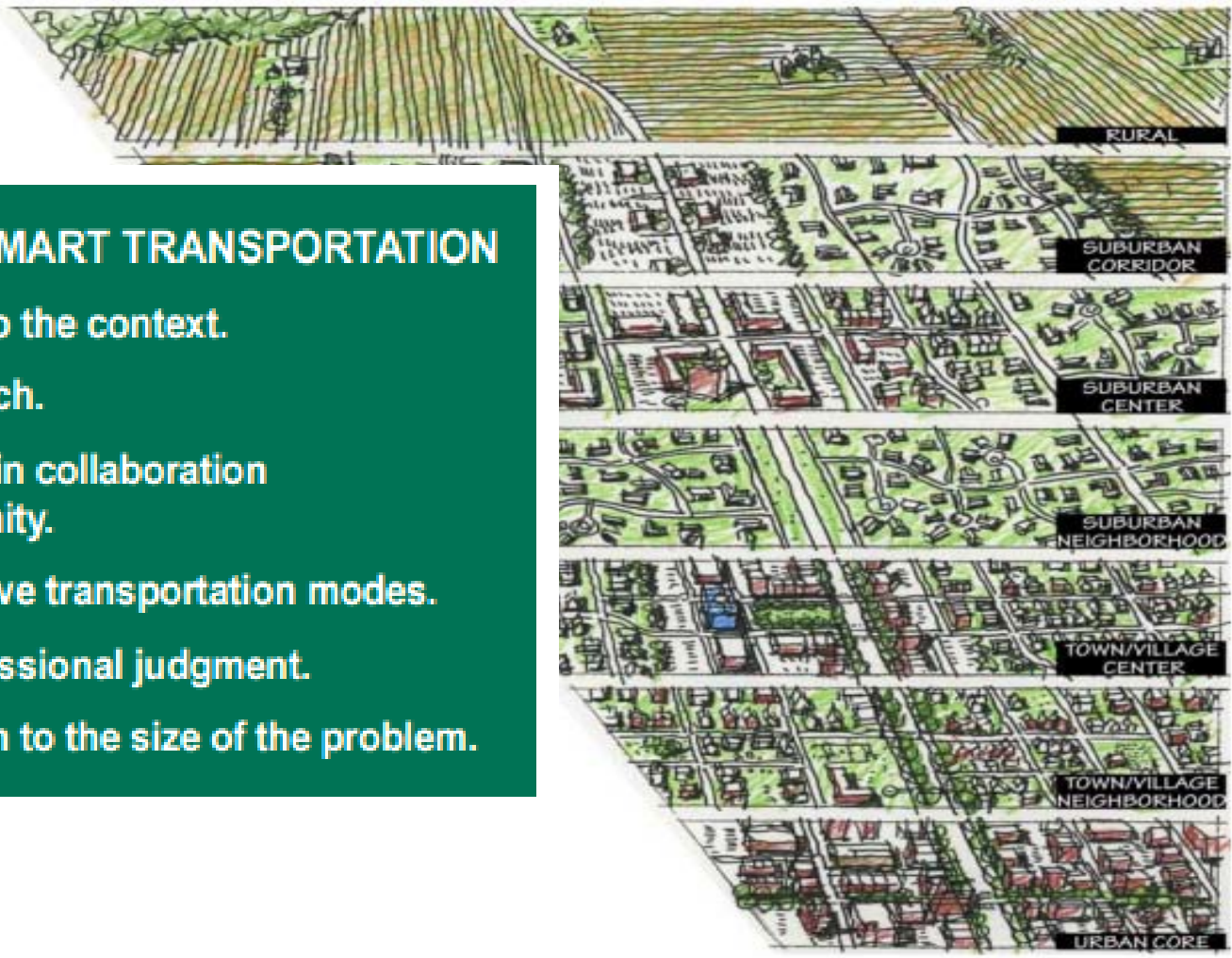




Smart Transportation Guidebook Context



- ## PRINCIPLES OF SMART TRANSPORTATION
1. Tailor solutions to the context.
 2. Tailor the approach.
 3. Plan all projects in collaboration with the community.
 4. Plan for alternative transportation modes.
 5. Use sound professional judgment.
 6. Scale the solution to the size of the problem.

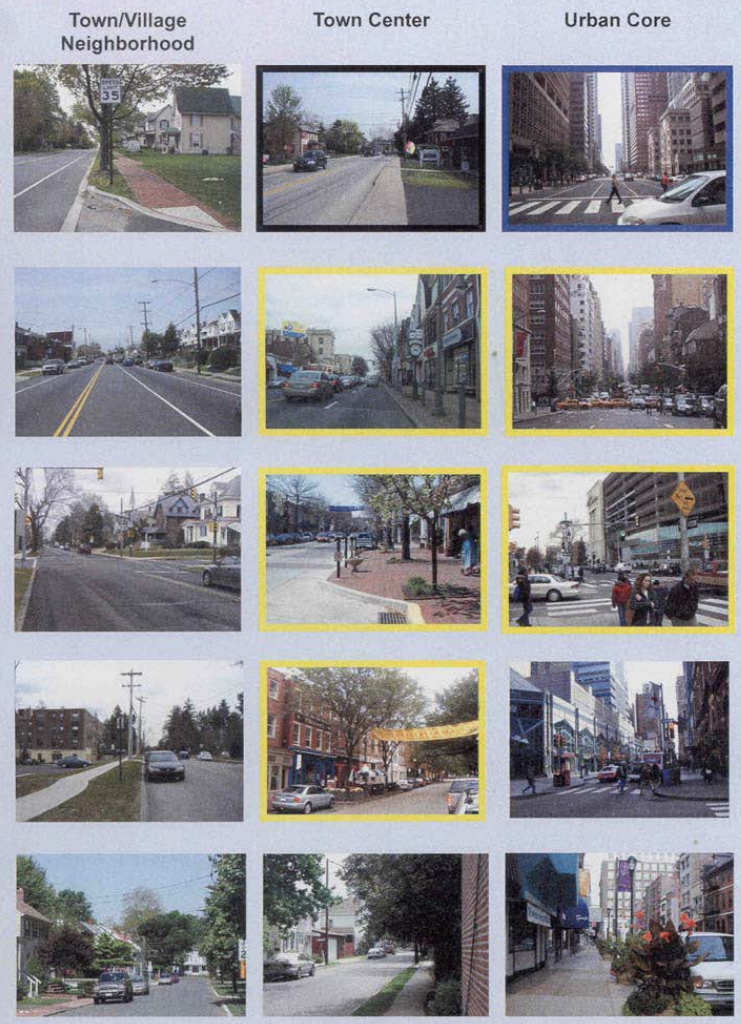
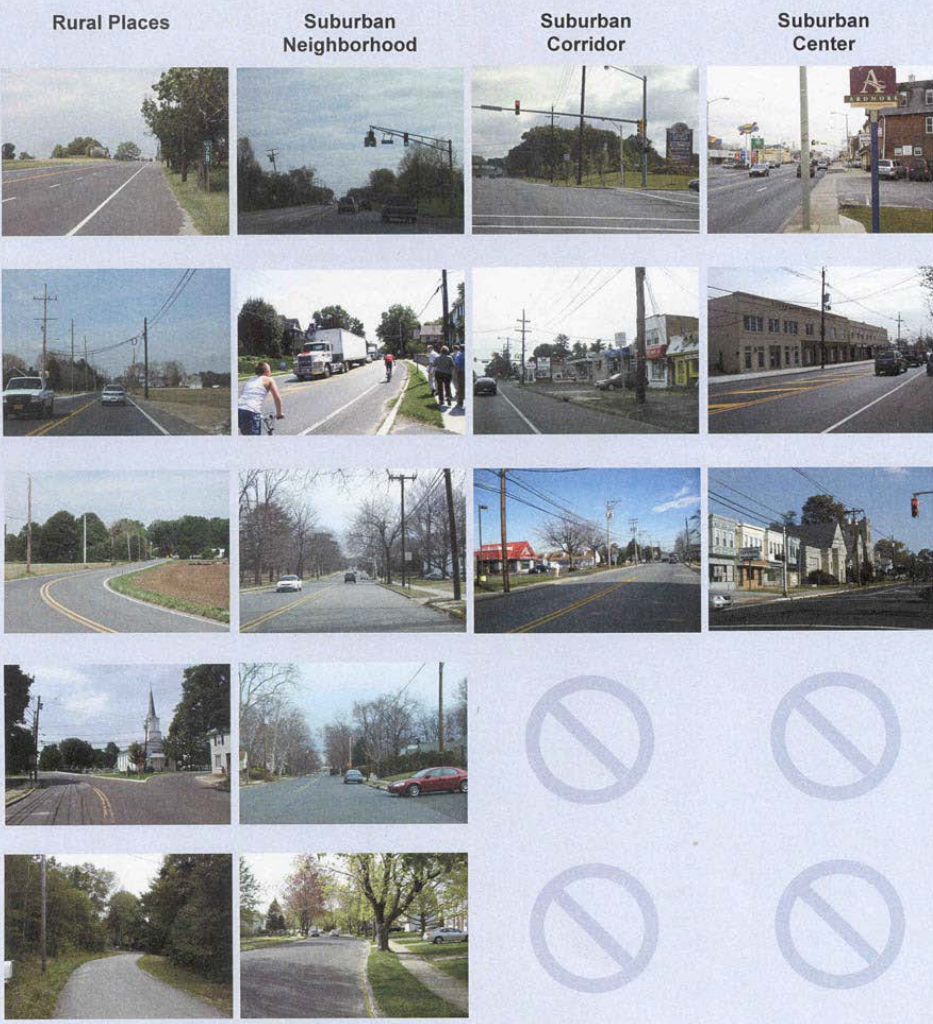




Design Manual Context



RURAL ————— **to** ————— **URBAN** —————>



REGIONAL
to
LOCAL

Regional Arterial

Community Arterial

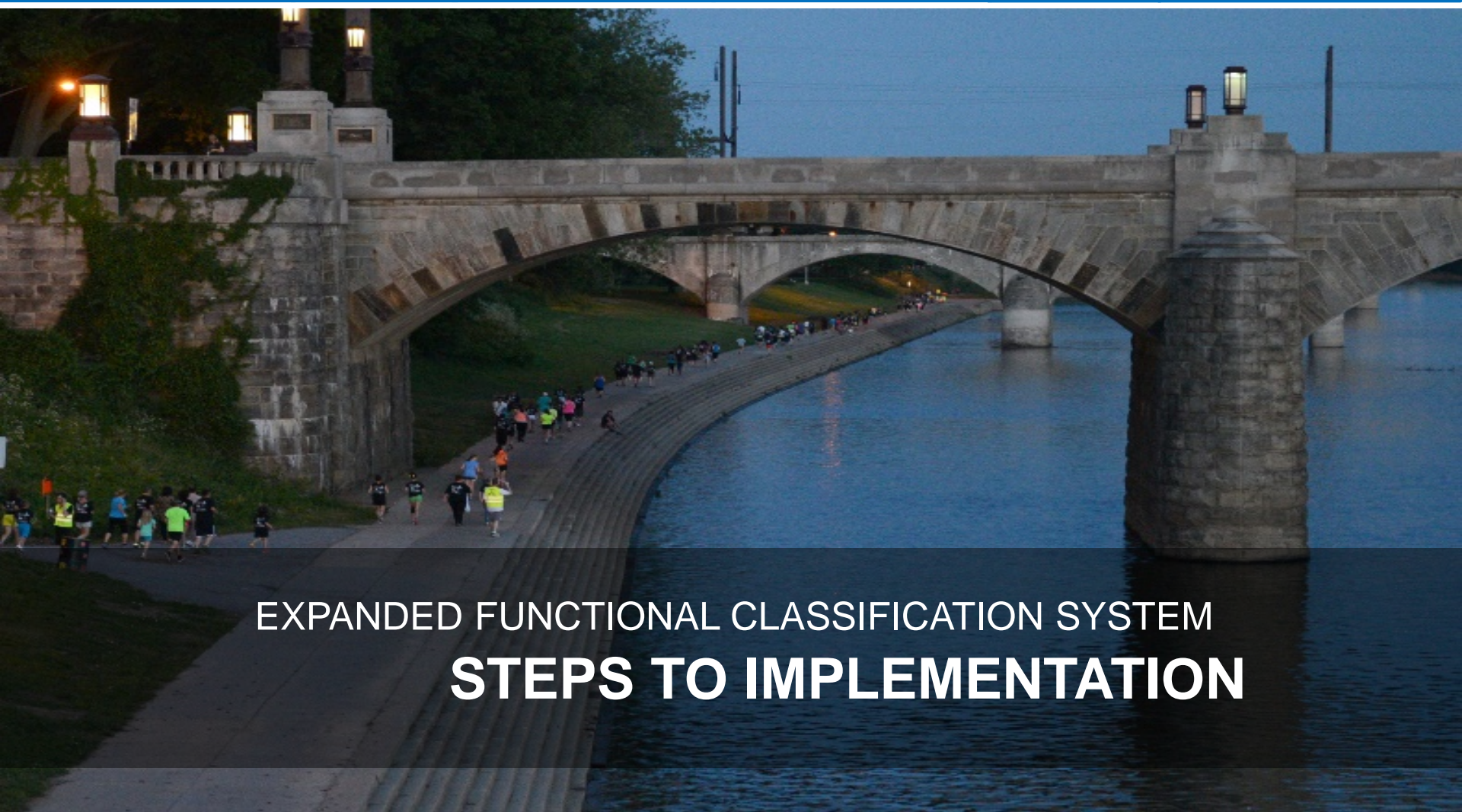
Community Collector

Neighborhood Collector

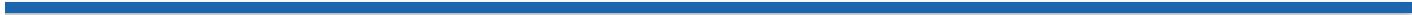
Local Road/ Street

The photos enclosed in a yellow box indicate the Town Center and Core City streets that also operate as a local or regional Main Street.

Figure 5.1 Roads in Context



EXPANDED FUNCTIONAL CLASSIFICATION SYSTEM
STEPS TO IMPLEMENTATION





Know What is Needed for an Effective Transportation Network



- Enable safe, convenient and comfortable travel for all residents
- Improve network connectivity for all modes and address gaps
- Focus on providing access to key destinations
- Align project designs with the goals articulated in state, regional, and local plans

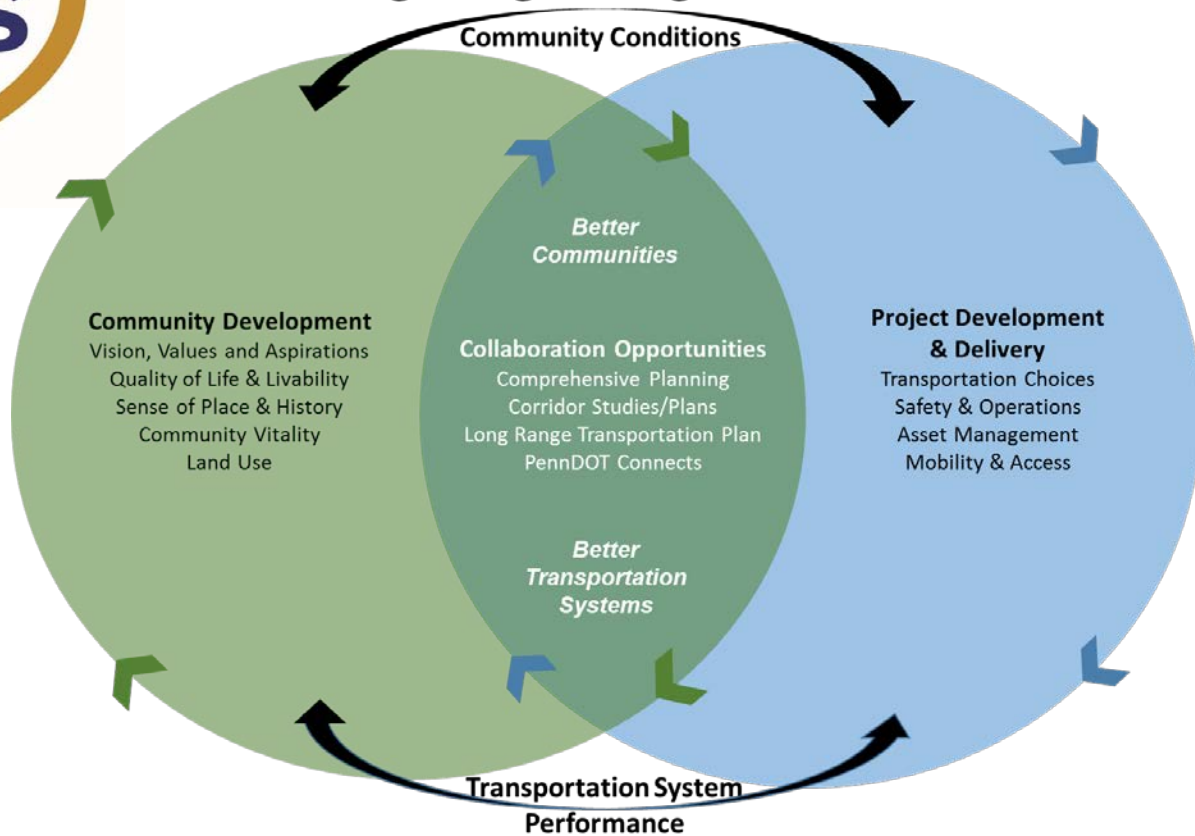




Involve Planning Partners

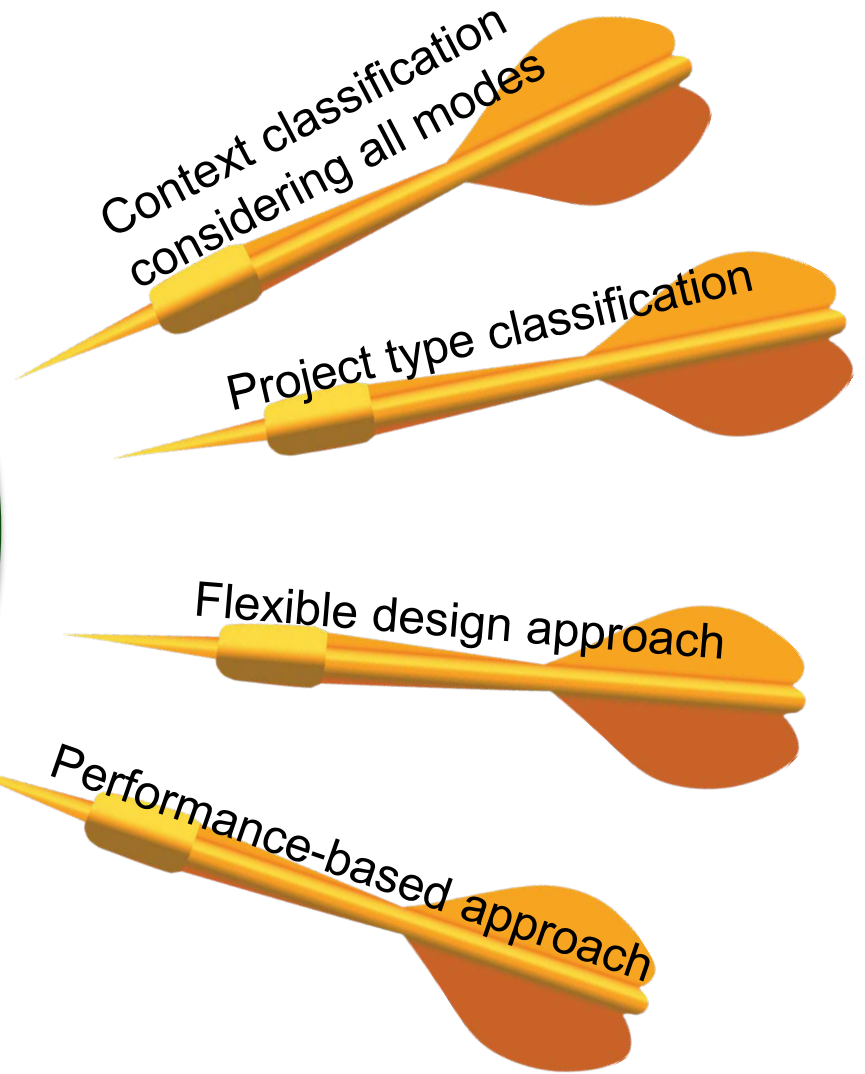
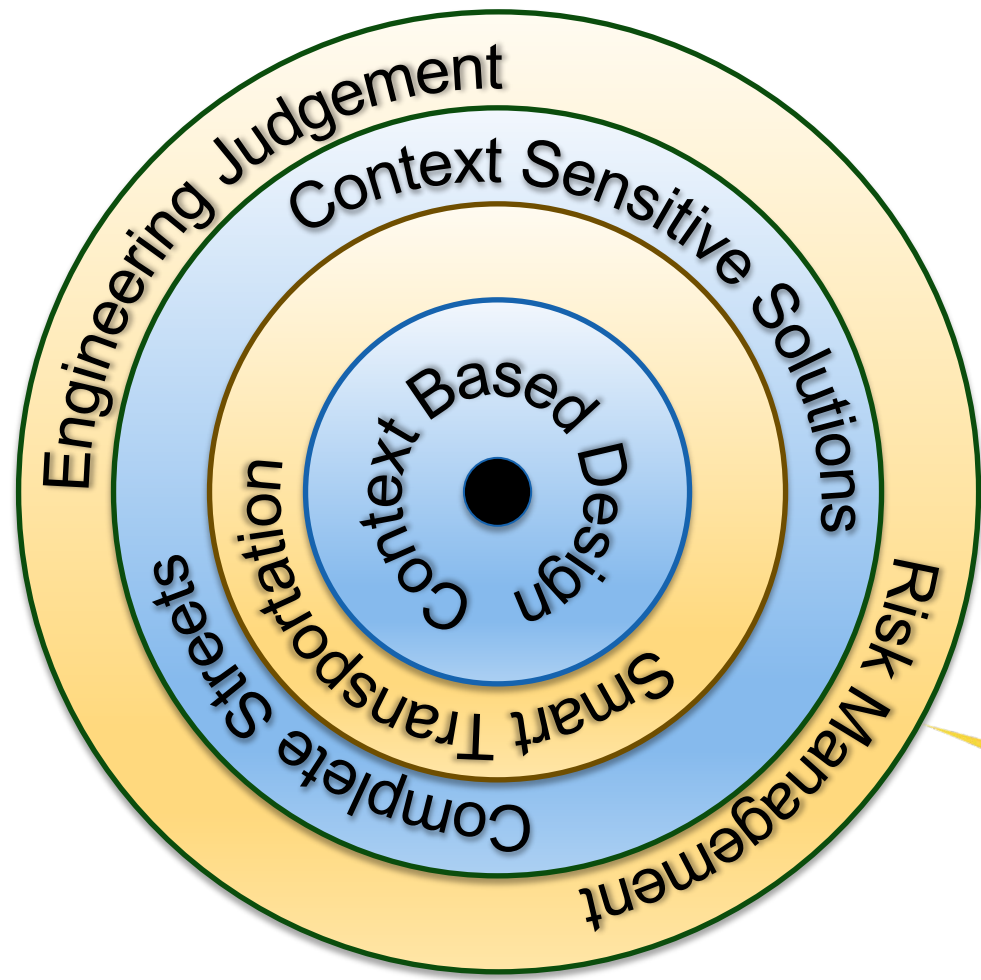


Planning & Engineering Collaboration





Retool Geometric Design Manual





Statewide Team



- Every District and Central Office
 - Portfolio Managers, Plans Engineers, Design Services Engineers, Liaison Engineers/Project Managers, Roadway Design Engineers, and Project Development Engineers
- FHWA Pennsylvania Division

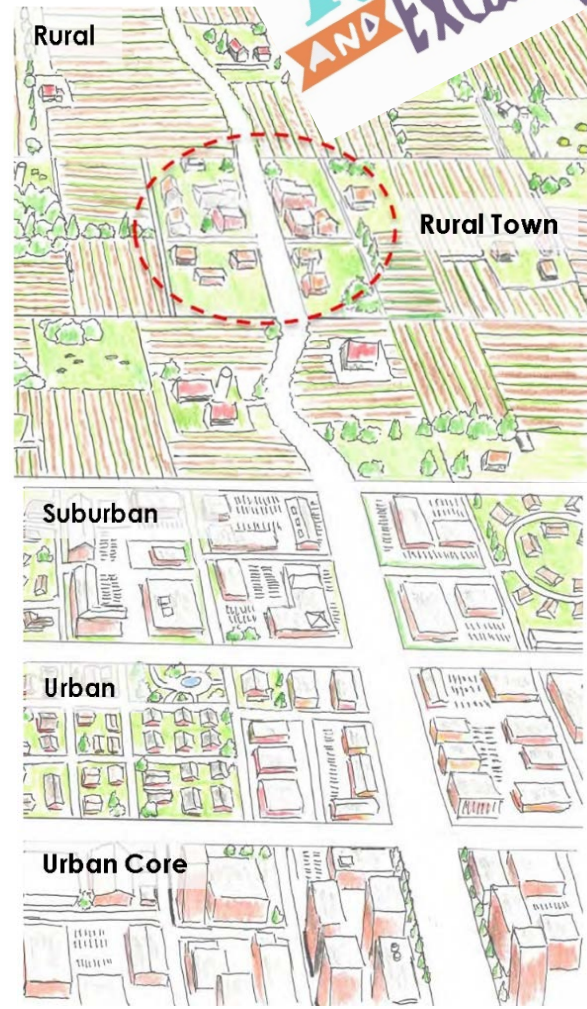




Context Change



From 7 to 5
Contexts

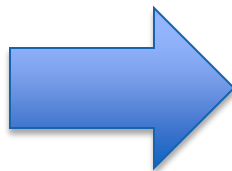




Functional Classification



- ✓ Limited Access Freeway
- ✓ Regional Arterial
- ✓ Community Arterial
- ✓ Community Collector
- ✓ Neighborhood Collector
- ✓ Local Road/Street

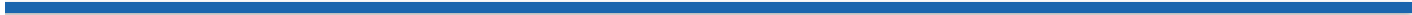


- ✓ Limited Access Expressway
- ✓ Arterial
- ✓ Collector
- ✓ Local Road/Street





EXPANDED FUNCTIONAL CLASSIFICATION SYSTEM
UNDERSTANDING DESIGN FLEXIBILITY





Statewide Discussion

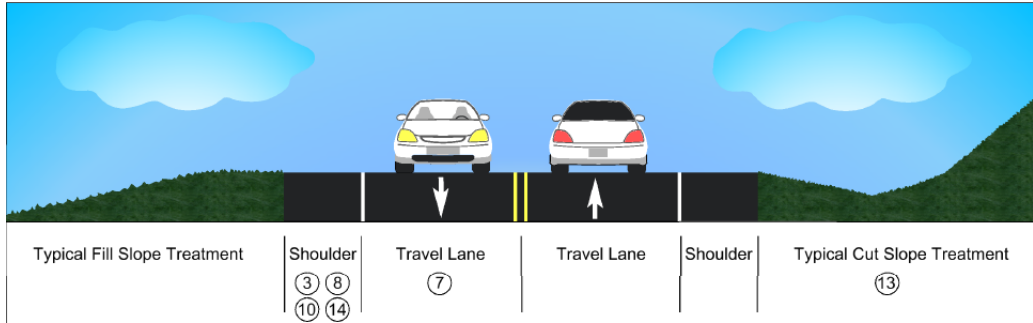


PennDOT Project Managers Meeting November 6 – 7, 2017



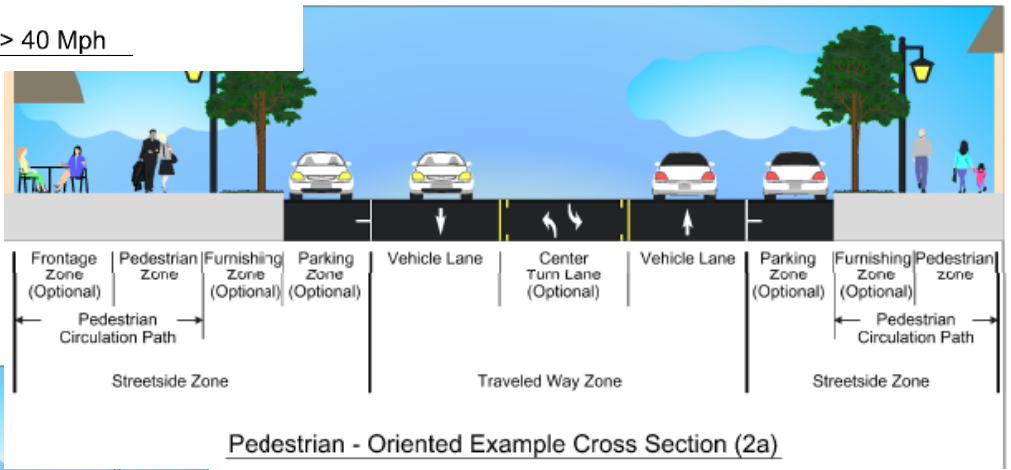


Discussion Item – Typical Sections

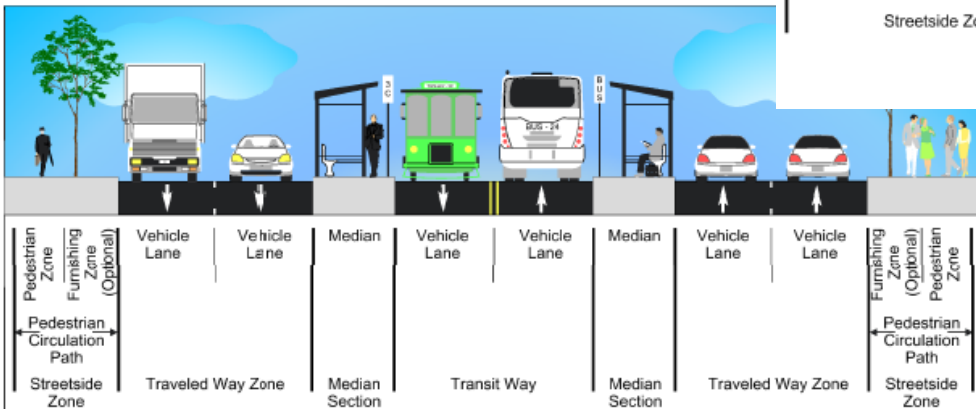


Arterial - Rural or Urban without Curbs, Speed > 40 Mph

- No dimensions
- Cross slope determined by drainage needs
- Mode accommodation as needed



Pedestrian - Oriented Example Cross Section (2a)



Transit - Oriented Cross Section Transit Boulevard (4a)

give us your input



Discussion Item – Vehicle Table



MATRIX OF DESIGN VALUES – COLLECTOR						
Collector		Rural	Rural Town	Suburban	Urban	Urban Core
Roadway	Lane Width ¹	Preferred: 12' Minimum: 10'	Preferred: 11' Minimum: 9'	Preferred: 12' Minimum: 10'	Preferred: 11' Minimum: 9'	Preferred: 11' Minimum: 9'
	Shoulder Width ^{2,3}	Preferred: 8' Minimum: 4'	Preferred: 6' or Curbed Minimum: 4' (if No Parking or Bike Lane)	Preferred: 10' Minimum: 4' Minimum: 4'* (if No Parking or Bike Lane)	Preferred: 6' or Curbed Minimum: 4'* (if No Parking or Bike Lane)	Preferred: 6' or Curbed Minimum: 4'* (if No Parking or Bike Lane)
	Parking Lane	NA	Parallel; Preferred: 8' Parallel; Minimum: 7'	N/A to 8' Parallel *(if No Parking or Bike Lane)	Parallel; Preferred: 8' Parallel; Minimum: 7'	Parallel; Preferred: 8' Parallel; Minimum: 7'
	Bike Lane ⁴	See DM-2, Exhibit 14.X	See DM-2, Exhibit 14.X	See DM-2, Exhibit 14.X	See DM-2, Exhibit 14.X	See DM-2, Exhibit 14.X
	Median (if needed) for Left Turn	NA	Preferred: 16' Minimum: 12'	Preferred: 16' Minimum: 12'	Preferred: 16' Minimum: 12'	Preferred: 16' Minimum: 12'
	Median (if needed) for Pedestrians Only	NA	Preferred: 8' Minimum: 6'	Preferred: 8' Minimum: 6'	Preferred: 8' Minimum: 6'	Preferred: 8' Minimum: 6'
	Median (if needed) for Landscaping	NA	Preferred: 10' Minimum: 8'	Preferred: 10' Minimum: 8'	Preferred: 10' Minimum: 8'	Preferred: 10' Minimum: 8'
	Curb Return ⁵	Preferred: 40' Minimum: 15'	Preferred: 25' Minimum: 10'	Preferred: 40' Minimum: 15'	Preferred: 25' Minimum: 10'	Preferred: 30' Minimum: 10'
	Travel Lanes	2	2 to 4	2 to 4	2 to 4	2 to 4
	Cross Slopes (minimum) ^{6,7}	2.0%	2.0%	2.0%	2.0%	2.0%
	Cross Slopes (maximum) ⁸	8.0%	6.0%	6.0%	6.0%	6.0%
	Vertical Grades (minimum) ⁹	0.5%	0.5%	0.5%	0.5%	0.5%
	Vertical Clearance ^{11A} (minimum)	14'-6" See DM-2, Chapter 3	14'-6" See DM-2, Chapter 3	14'-6" See DM-2, Chapter 3	14'-6" See DM-2, Chapter 3	14'-6" See DM-2, Chapter 3
	Roadside	Clear Sidewalk Width ¹⁰	NA	Preferred: 6' Minimum: 5'	Preferred: 8' Minimum: 4'	Preferred: 8' Minimum: 6'
Buffer ¹¹		NA	Preferred: 5' Minimum: 3'	Preferred: 10' Minimum: 4'	Preferred: 5' Minimum: 3'	Preferred: 6' Minimum: 4'
Shy Distance		NA	Preferred: 2' Minimum: 0'	Preferred: 2' Minimum: 0'	Preferred: 2' Minimum: 0'	Preferred: 2' Minimum: 0'
Total Sidewalk Width		NA	Preferred: 13' Minimum: 8'	Preferred: 15' Minimum: 4'	Preferred: 15' Minimum: 11'	Preferred: 18' Minimum: 12'
Clear Zone Widths ¹²		See DM-2 Chapter 12	See DM-2 Chapter 12	See DM-2 Chapter 12	See DM-2 Chapter 12	See DM-2 Chapter 12
Stopping Sight Distance (minimum)		2011 AASHTO Green Book, Table 6-3	2011 AASHTO Green Book, Table 6-3	2011 AASHTO Green Book, Table 6-3	2011 AASHTO Green Book, Table 6-3	2011 AASHTO Green Book, Table 6-3
Passing Sight Distance (minimum)		DM-2, Exhibit 3-X	DM-2, Exhibit 3-X	DM-2, Exhibit 3-X	DM-2, Exhibit 3-X	DM-2, Exhibit 3-X
Vertical Grades (maximum) ¹⁴	2011 AASHTO Green Book, Table 6-2	2011 AASHTO Green Book, Table 6-8	2011 AASHTO Green Book, Table 6-8	2011 AASHTO Green Book, Table 6-8	2011 AASHTO Green Book, Table 6-8	

See Table 3.XXXXX

Move to Pedestrian Chapter?

If all the values are the same, do they need to be in the table?

If all the values are the same, do they need to be in the table?

give us your input

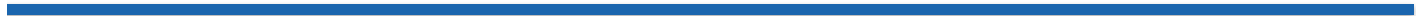




Discussion Item – Project Documentation

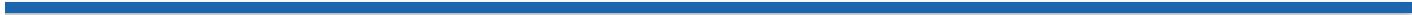
- Flexibility creates an environment for designers to use engineering judgement rather than picking numbers.
- Flexibility creates the need to Document the Decision Making Process
 - Documenting and communicating assumptions and decisions reduces misunderstandings and wasted work
 - Provide a clear understanding of the project
 - Understand who is responsible for the final decision
- Document decisions and why they were made. If approvals are required, obtain them and keep with the documentation.
- **How is your documentation done?**

give us your input





EXPANDED FUNCTIONAL CLASSIFICATION SYSTEM
BALANCE MULTIMODAL SOLUTIONS





Multimodal Decision Correlation Matrix



- Overlays* for:

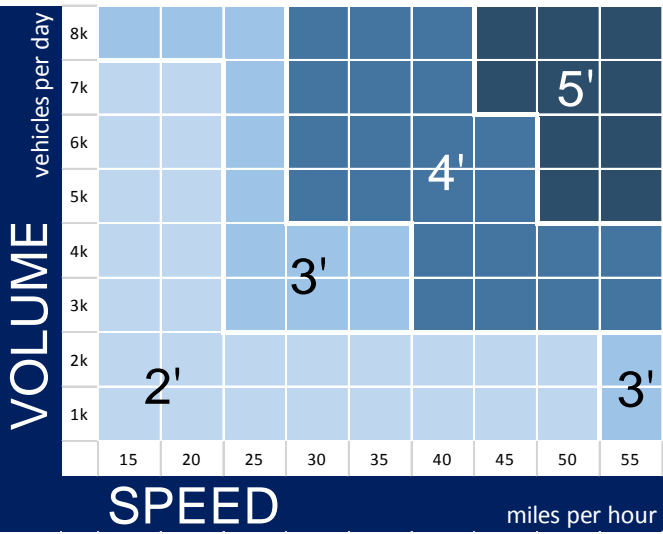
- ✓ Bicycle
 - ✓ Pedestrian
 - ✓ Transit
 - ✓ Freight
 - ✓ Plain People
Community
Considerations
- } Complete Rewrite
- } New

Context \ Roadway	Rural	Rural Town	Suburban	Urban	Urban Core
Roadway					
Principal Arterial	DRIVER				
	BICYCLIST				
	PEDESTRIAN				
Minor Arterial					
Collector					
Local					

* Overlays may not exactly replicate design parameter tables



Bicycle Considerations



BICYCLE FACILITY CONTEXTUAL GUIDANCE

FACILITY TYPE

BICYCLE BOULEVARD
 ●●●○
 Comfortable and attractive bicycling environment without utilizing physical separation; typically employs techniques to prioritize bicycling.

BIKE ROUTE
 ●●○○○
 Marking that is applicable on roadways where speed differential between motorists and bicyclists is low and/or to fill short gaps in the bikeway network.

BIKE LANE
 ●●○○○
 Exclusive space for bicyclists through the use of pavement markings and signage (without buffers or barriers).

BUFFERED BIKE LANE
 ●●●○○
 Traditional bike lane separated by painted buffer to vehicle travel lanes and/or parking lanes.

PROTECTED BIKE LANE
 ●●●●○
 Physically separated bikeway. Could be one or two way and protected by a variety of techniques

PATHWAY
 ●●●●●
 Completely separated from roadway, typically shared with pedestrians

STREET CLASS

LOCAL

LOCAL

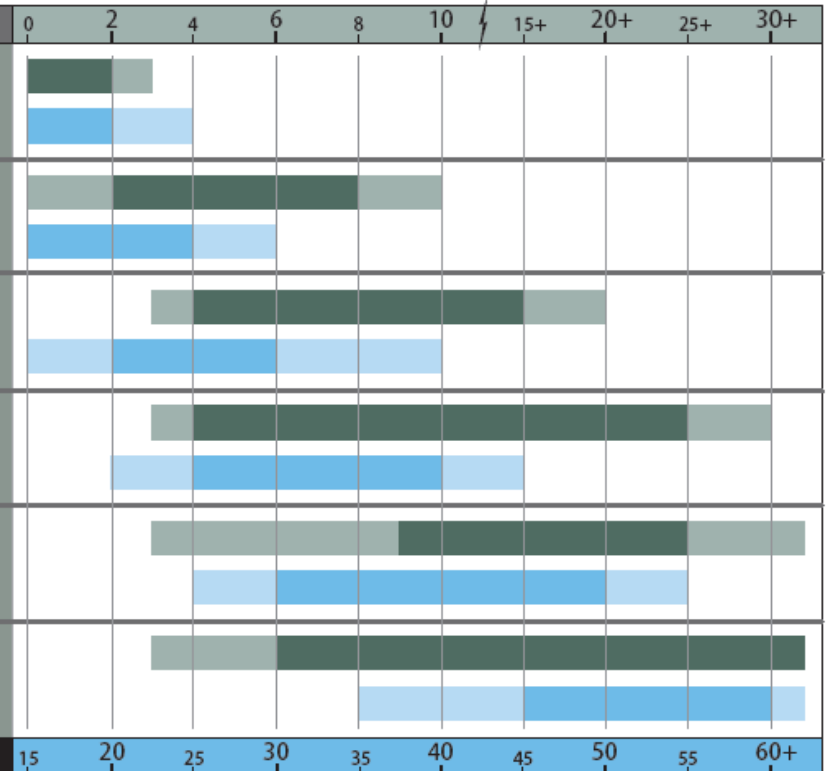
COLLECTOR ARTERIAL

COLLECTOR ARTERIAL

COLLECTOR ARTERIAL

COLLECTOR ARTERIAL

AVERAGE ANNUAL DAILY TRAFFIC (1,000 veh/day or 100 veh/peak hr)



LEGEND

SEPARATION

- Minimal Separation
- Moderate Separation
- Good Separation
- High Separation

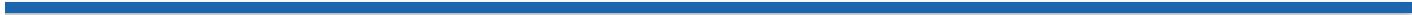
min	VOLUME	max
min	SPEED	max
Acceptable	Desired	Acceptable

Rural, Rural Town, and Suburban Bicycle Considerations

Rural Town, Urban, and Urban Core Bicycle Considerations



EXPANDED FUNCTIONAL CLASSIFICATION SYSTEM IMPLEMENTATION CHALLENGES

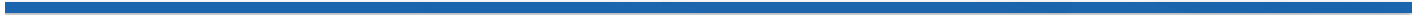




Challenges to the Change



- Getting past the “That’s the way it’s always been done.”
- Creating an environment for designers to use engineering judgement rather than picking numbers.
- Attaining buy-in on engineering criteria.
- Reaching all audiences for training.





Lessons Learned

- Get upper management by-in from the outset.
- Use a control group.
- Be ready to address unanticipated issues.
- It takes longer than you think!

BE ALERT!!

**EXPECT THE
UNEXPECTED**



Contact Information

Brian E. Shunk, P.E.

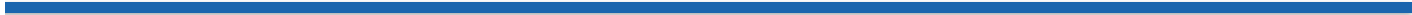
Project Development Engineer

PennDOT - Bureau of Project Delivery

400 North Street – 7th Floor Harrisburg, PA 17120

Phone: 717.214.1276

bshunk@pa.gov



Today's Participants

- Fred Dock, *City of Pasadena*, fdock@cityofpasadena.net
- Nikiforos Stamatiadis, *University of Kentucky*, nick.stamatiadis@uky.edu
- John Donahue, *Washington State Department of Transportation*, donahjo@wsdot.wa.gov
- Brian Shunk, *Pennsylvania Department of Transportation*, bshunk@pa.gov



Get Involved with TRB

- Getting involved is free!
- Join a Standing Committee (<http://bit.ly/2jYRrF6>)
- Become a Friend of a Committee (<http://bit.ly/TRBcommittees>)
 - Networking opportunities
 - May provide a path to become a Standing Committee member
- For more information: www.mytrb.org
 - Create your account
 - Update your profile

Get involved with NCHRP

- Suggest NCHRP research topics
- Volunteer to serve on NCHRP panels
- Lead pilot projects and other implementation efforts at your agency
- For more information:
<http://www.trb.org/nchrp/nchrp.aspx>

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- Must register as an individual to receive credits (no group credits)
- Credits will be reported two to three business days after the webinar
- You will be able to retrieve your certificate from RCEP within one week of the webinar