Freight Roadway Design Considerations

Summary Status Presentation

January 2015

Agenda

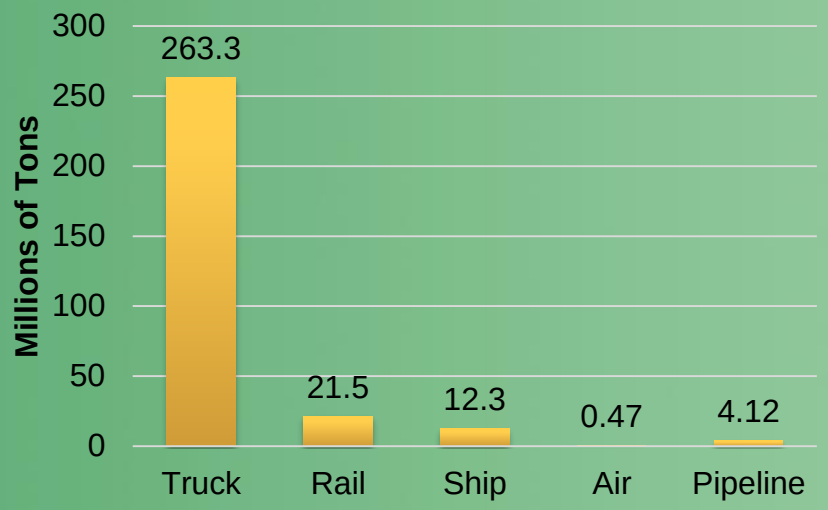
- Where we've been: Tampa Bay Strategic Freight Plan
- Where we are: District 7 Freight Roadway Design Guidelines Draft
- Where we're heading: Regional / statewide coordination

Why a Strategic Freight Plan?

- Improve freight mobility, safety and operations
- Support economic development
- Position region for funding opportunities

Strategic Plan Background

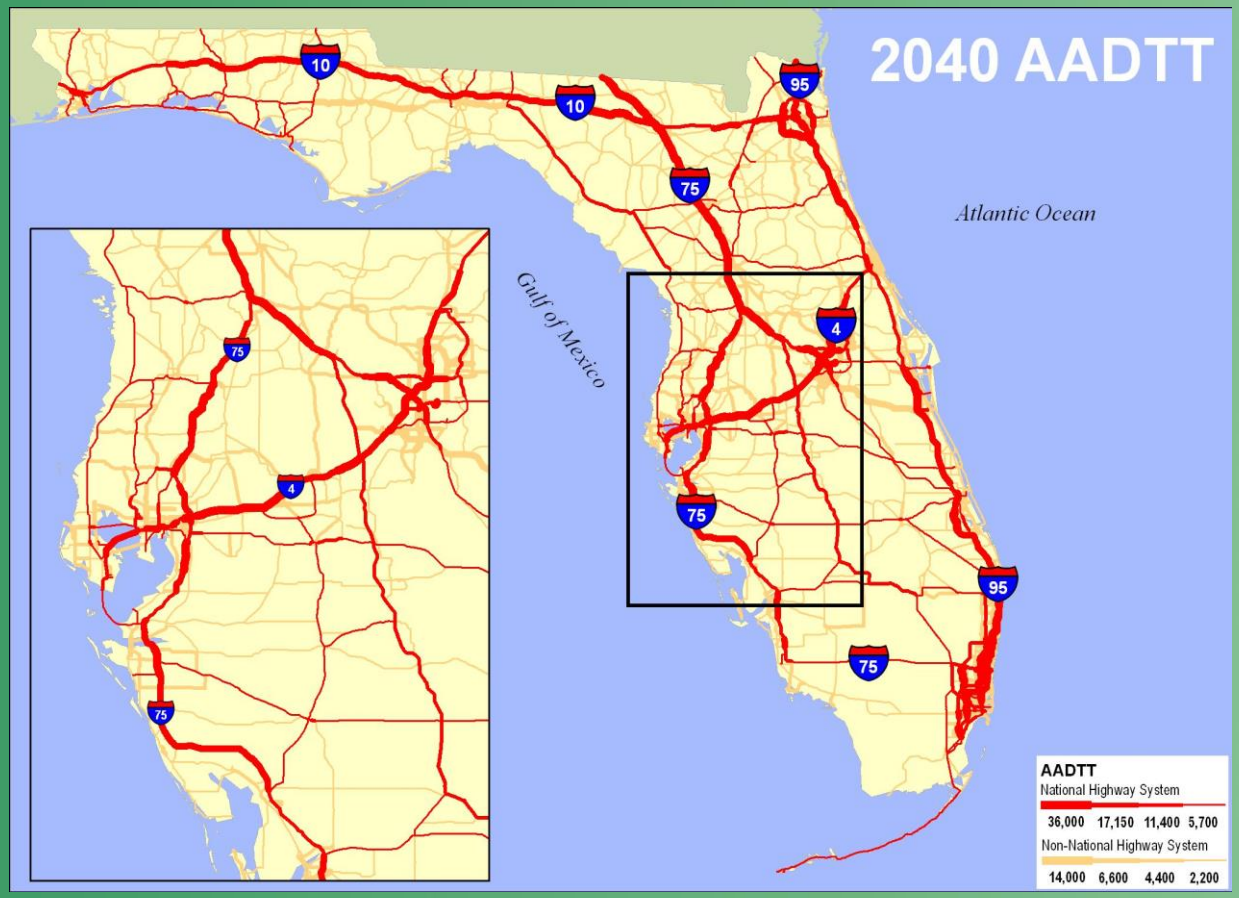
- Regionally about 300 million tons of cargo estimated at $221 billion originates, terminates or passes through the Tampa Bay region annually
- Trucks transport about 85% of the total tonnage
- All other modes depend on trucks at some point in the goods movement process



Source:
Freight Analysis Framework 3.3 (2012)
Tampa Bay Metropolitan Area

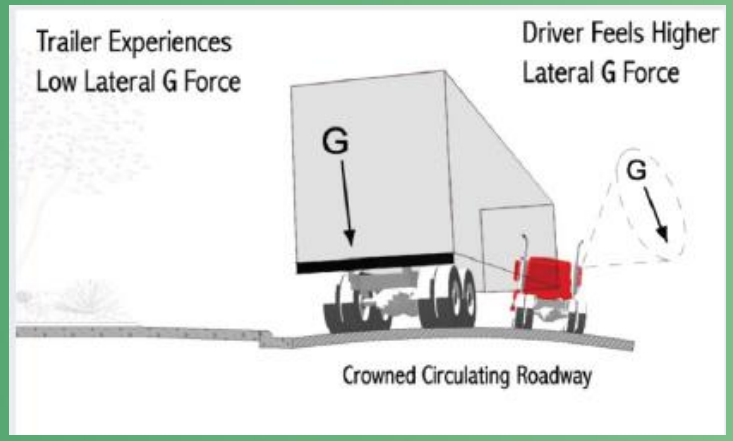
Strategic Plan Background

Truck traffic is growing and contributing to congestion for all.



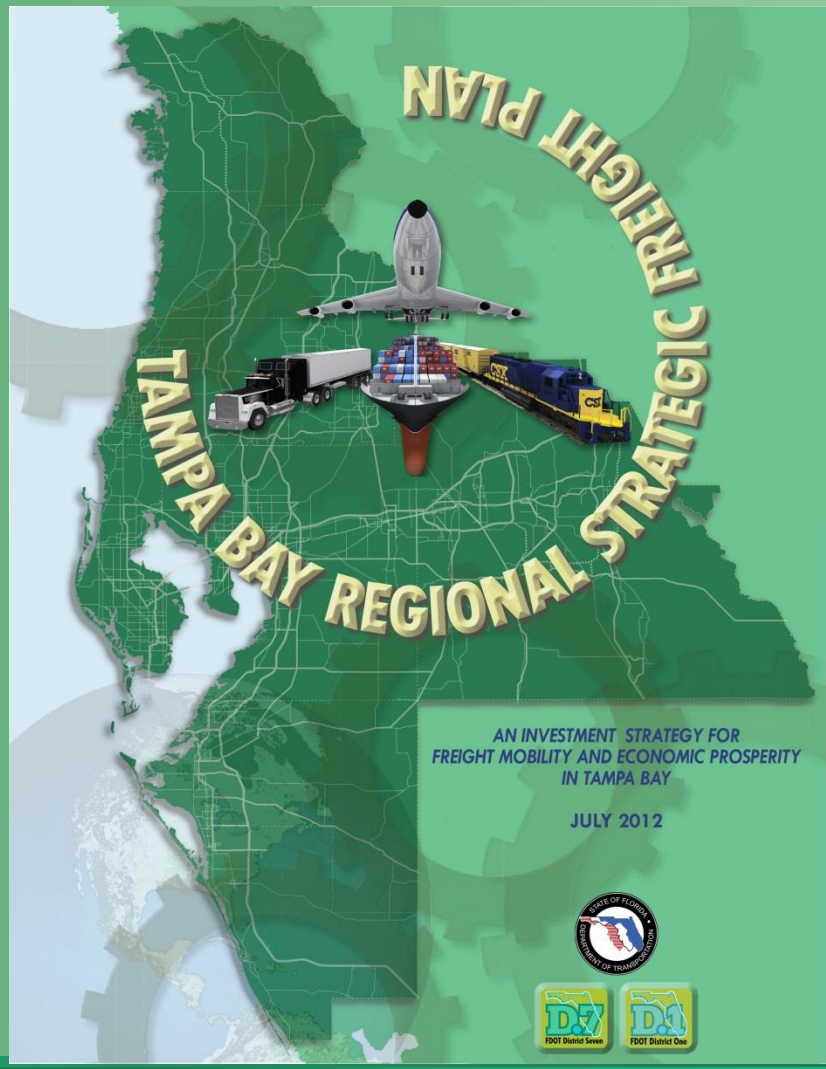
Strategic Plan Background

Trucks have unique operating characteristics



Strategic Freight Plan Chapters

1. Regional Goods Movement: Links to our Past and our Future
2. National, State, and Regional Freight Picture
3. Economic Value of Enhanced Freight Mobility
4. Regional Freight Infrastructure and Modal Assets
5. Investment in the Regional Freight Network
6. Challenges to Efficient Goods Movement
7. Assessment of Freight Mobility Needs
8. Policy Framework and Priority Investment Strategies
9. Implementation Guidance
10. Working Together: A Coordinated Approach



Policy Framework - Approach

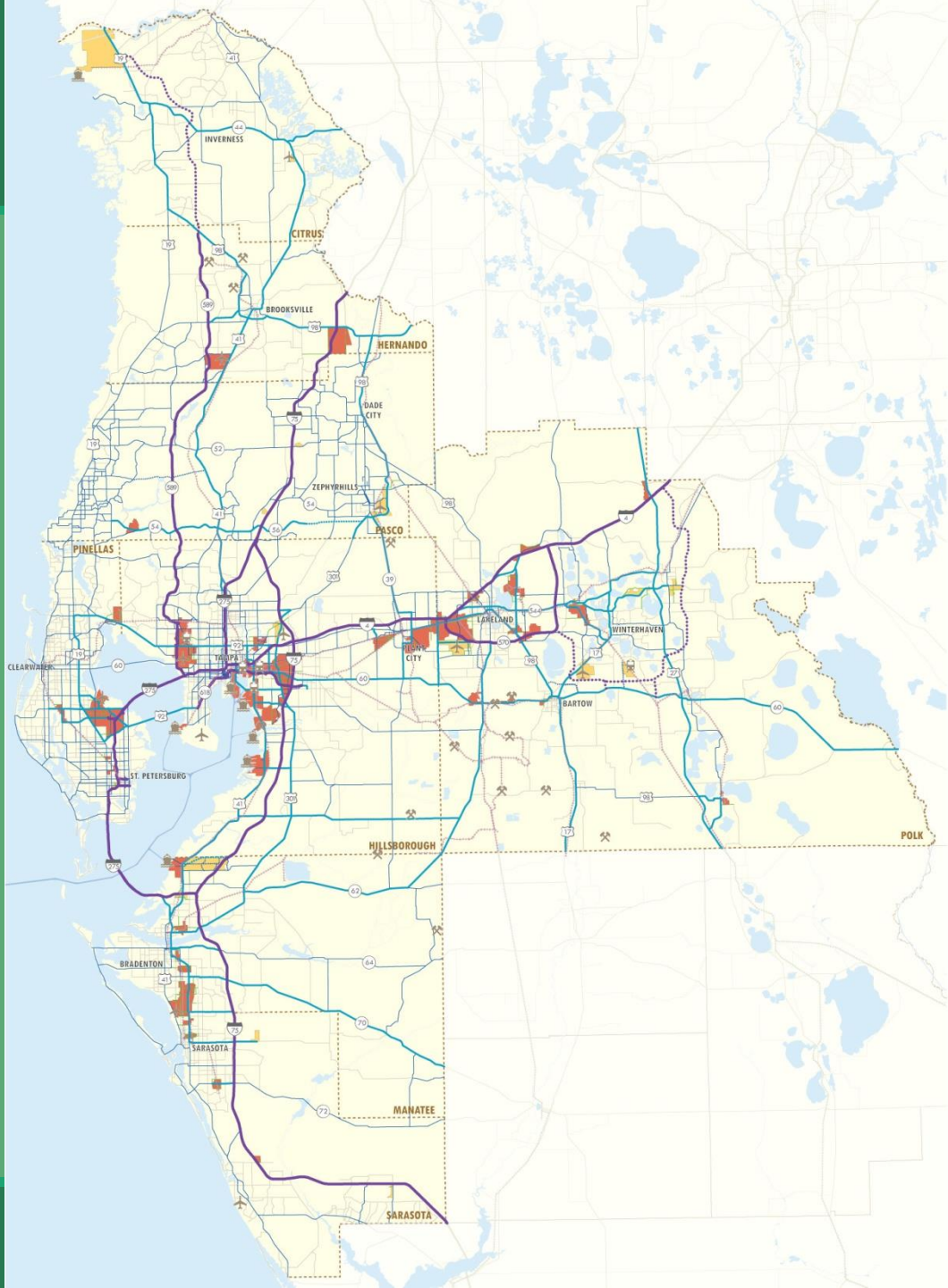
- Develop a policy framework for freight planning that supports the economic and quality of life goals for the region
- Understand the nature and geography of urban form and freight activities
- Identify where freight activity conflicts with land uses and associated activities
- Identify freight-specific projects and roadway design guidance that considers corridor function and corridor land use

Implementation Strategy Considerations

- Freight facility functionality
- Freight and land use compatibility
- Shared users of corridor
- Corridor capacity and operational issues

Freight Facility Types

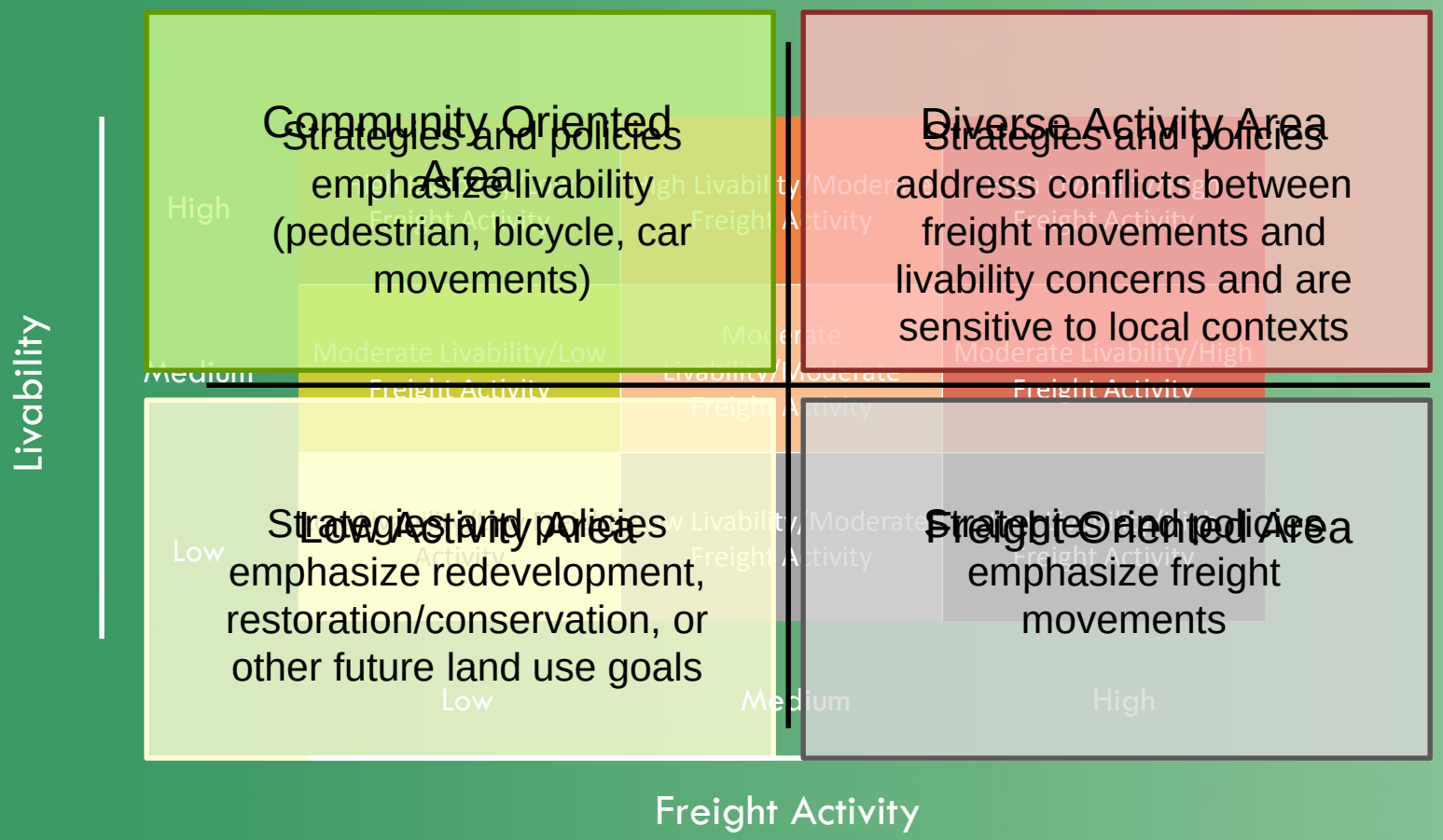
- Limited Access Facilities
- Regional Freight Mobility Corridors
- Other Designated Truck Routes
- Freight Activity Center Streets



Freight Roadway Network Functions

- Mobility
  - Smooth, efficient traffic flow
  - High travel speeds
- Connectivity
  - Links Freight Activity Centers to Strategic Trade Corridors
  - Links between Freight Activity Centers, where warranted
- Circulation
  - Local movements and distribution
- Access
  - Efficient access to destinations

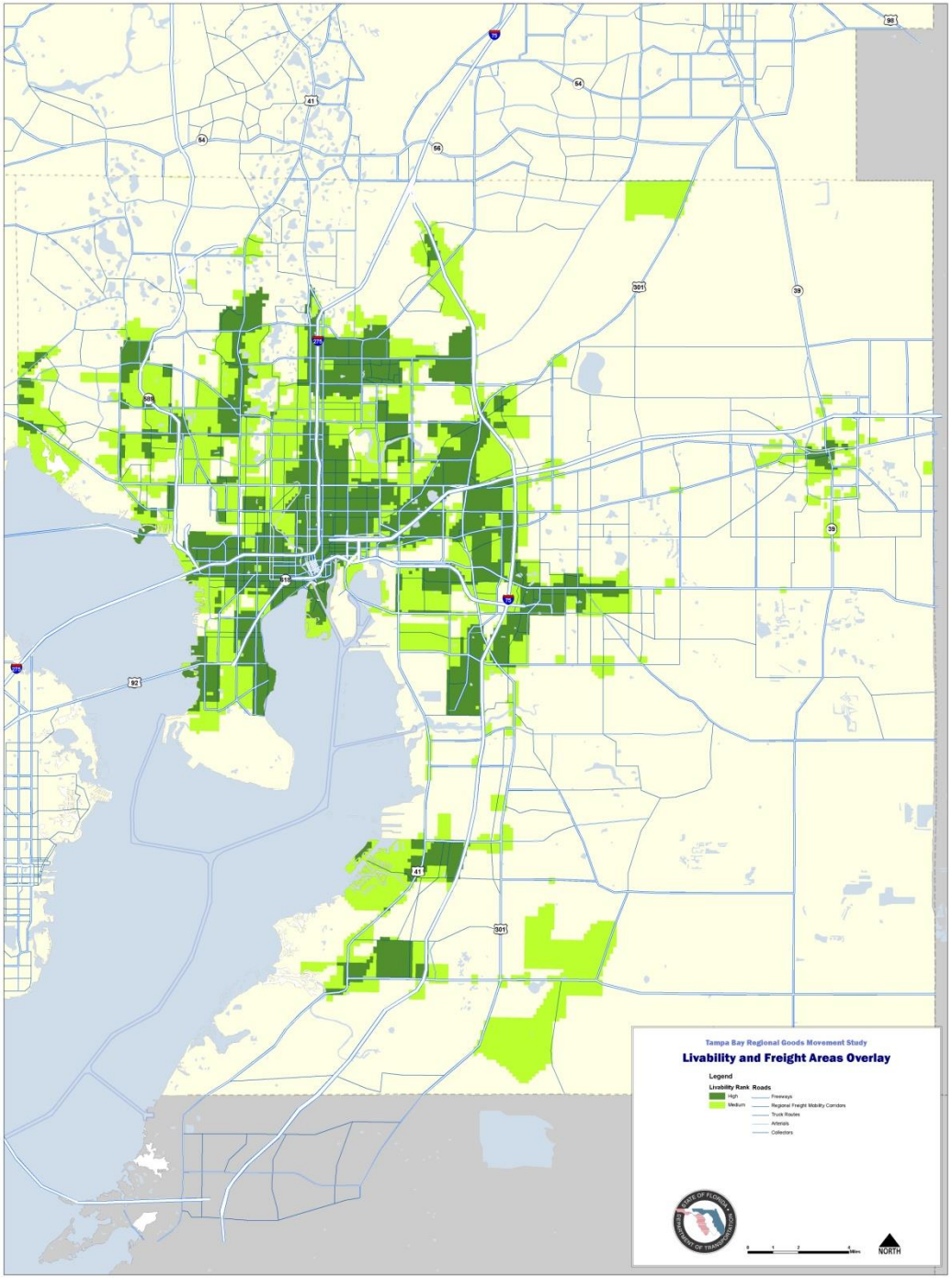
Policy Framework



Livability Areas

Livability Indicators	Score
Station areas (1/2 mi buffer)	3
Livable FLUs	2
Industrial FLUs	-1
CRAs	1
Activity Centers	
Hillsborough	
Primary	2
Secondary	1
Tampa	
Business Centers	2
Urban Villages	1
Plant City	
Midtown	1
CCC Regional Anchors	
Tier	
Low	1
High	2
Freight Activity Centers	-1

Hi	3 or more
Med	1 to 2
Low	-1



Freight Areas

Freight Indicators	
Freight Activity Centers	
Intensity	
Low	2
Medium	2
High	3
Industrial FLUs	1
Percent Truck Traffic	
< 3%	0
3-5%	1
5-10%	2
> 10%	3

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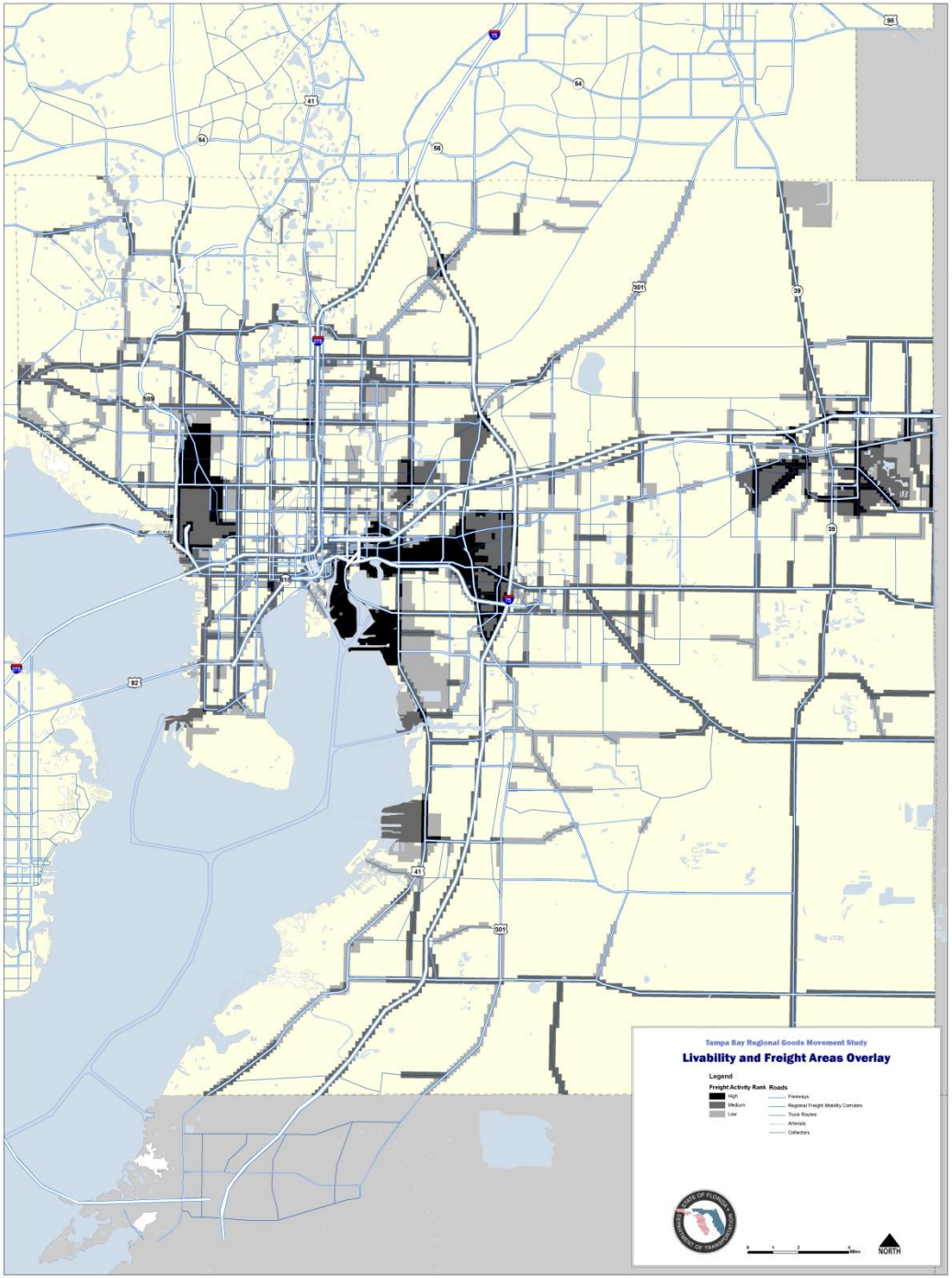
High Truck Traffic (over

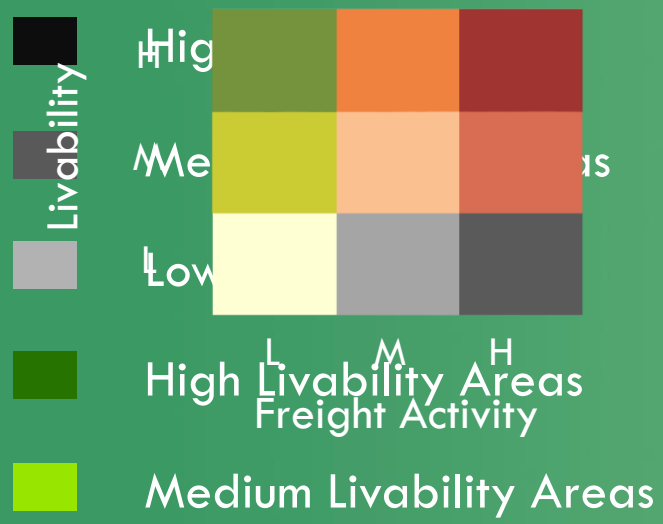
Hi	4 or more
Med	2 to 3
Low	1

Truck Traffic (5-10%)

Low Truck Traffic (3-5%)

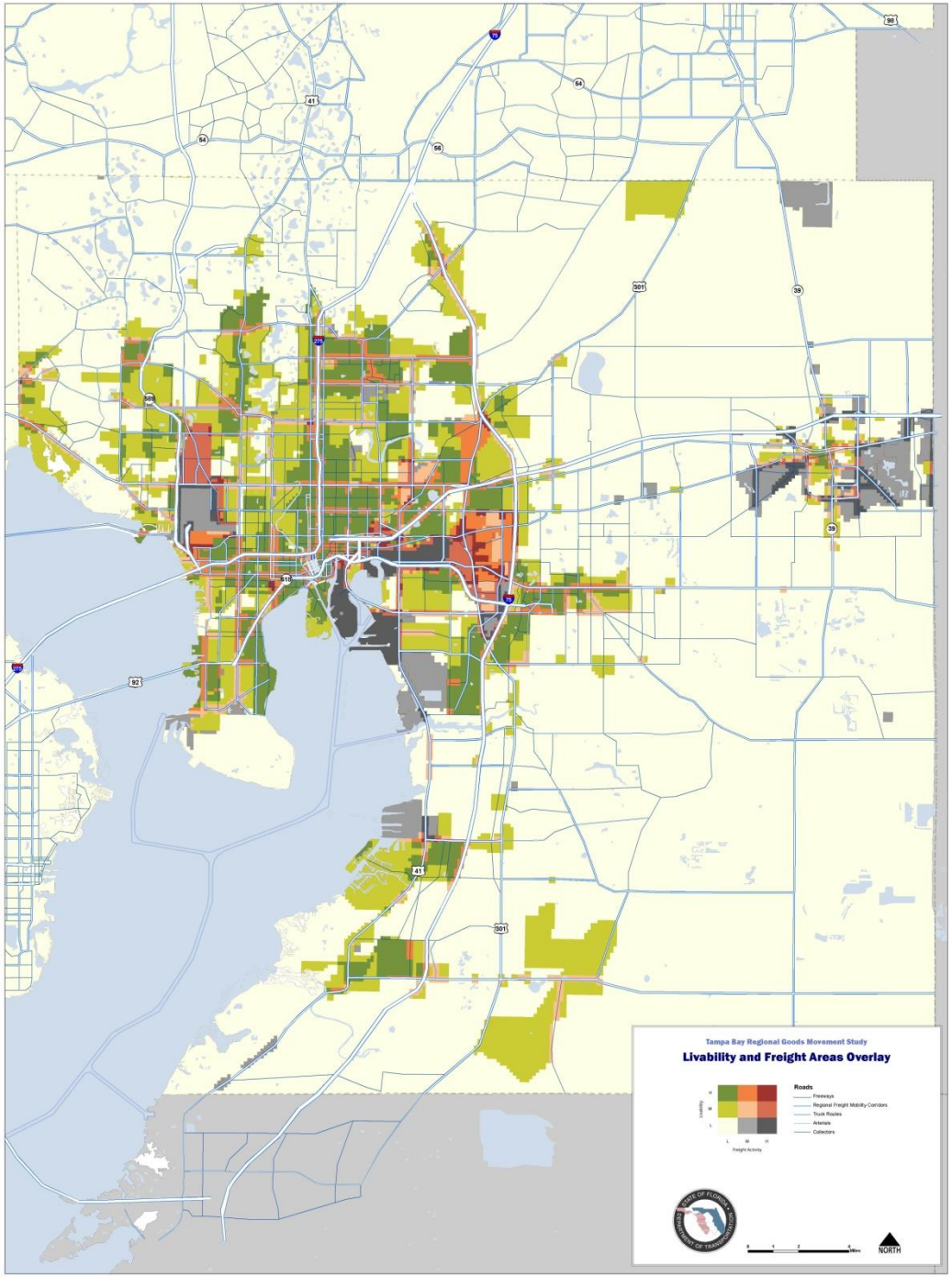


Livability and Freight Activity Overlay

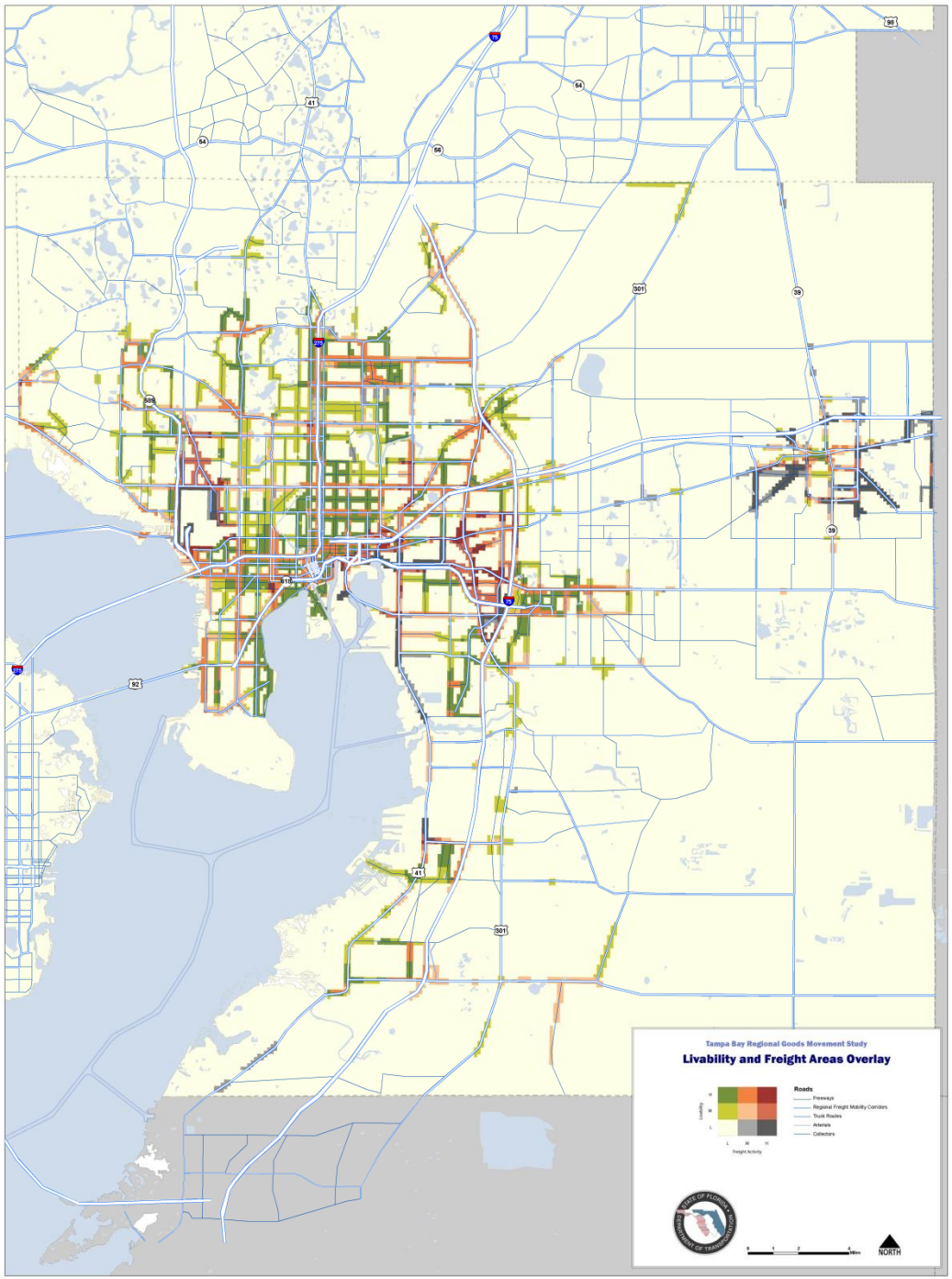


High Livability Areas

Medium Livability Areas



Livability and Freight Activity Overlay - Corridors



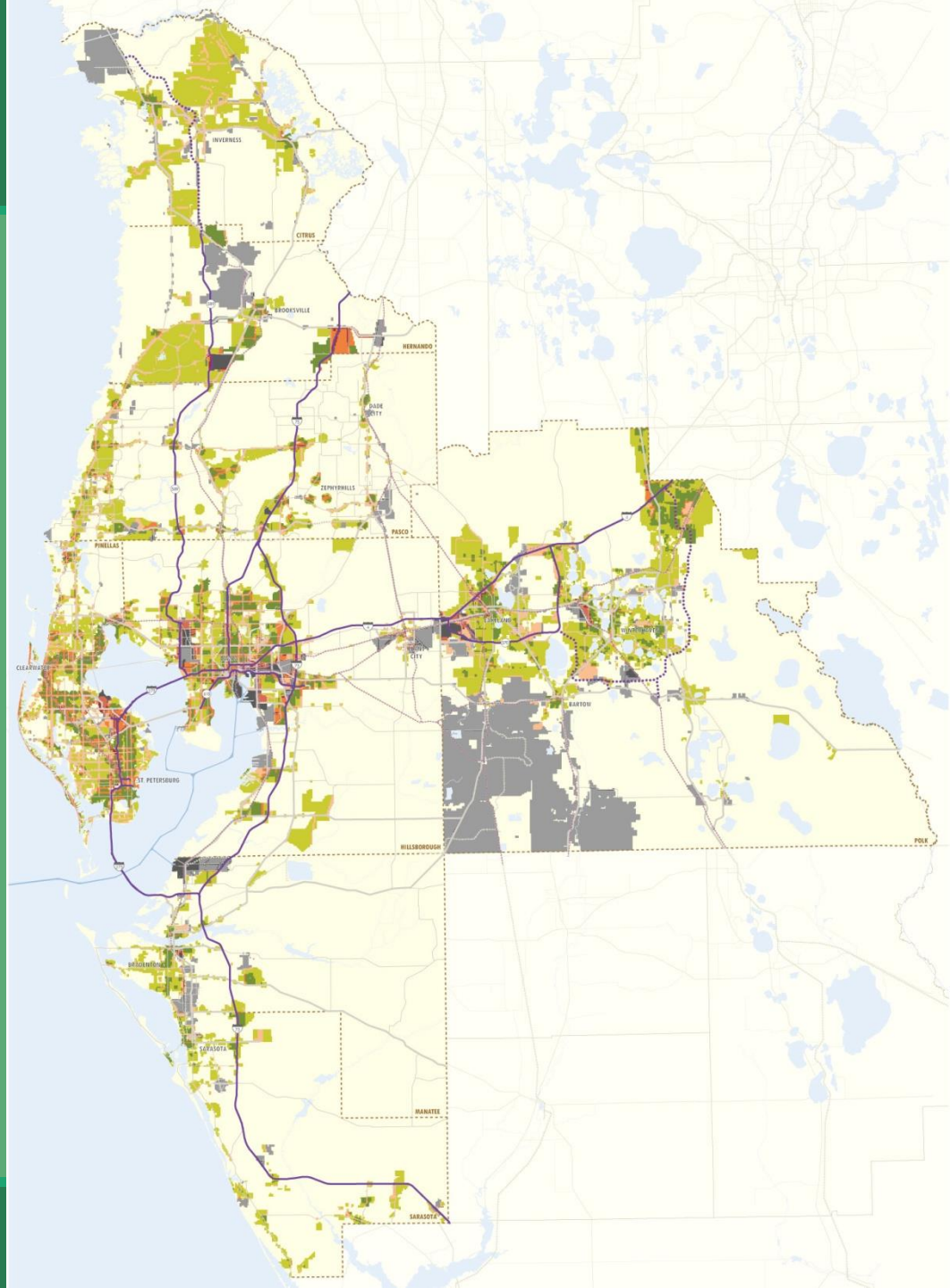
Freight Roadway Design Considerations (FRDC)

January 2015 Summary Status Presentation

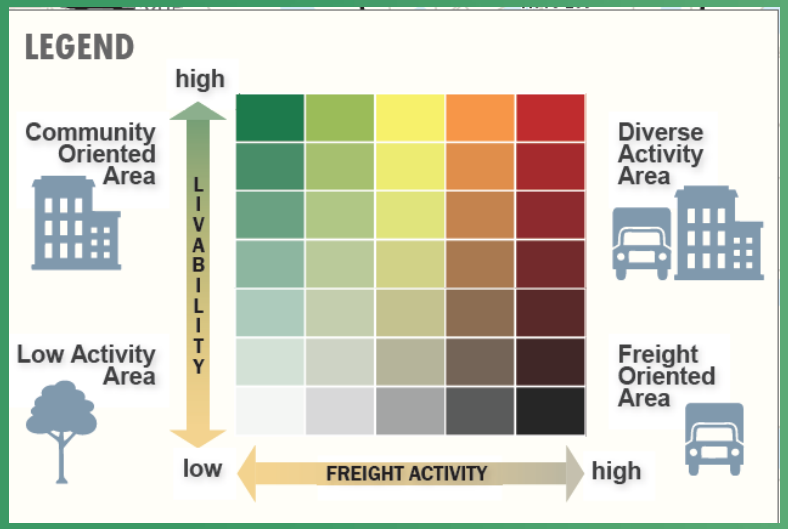
Livability and Freight Activity Overlay

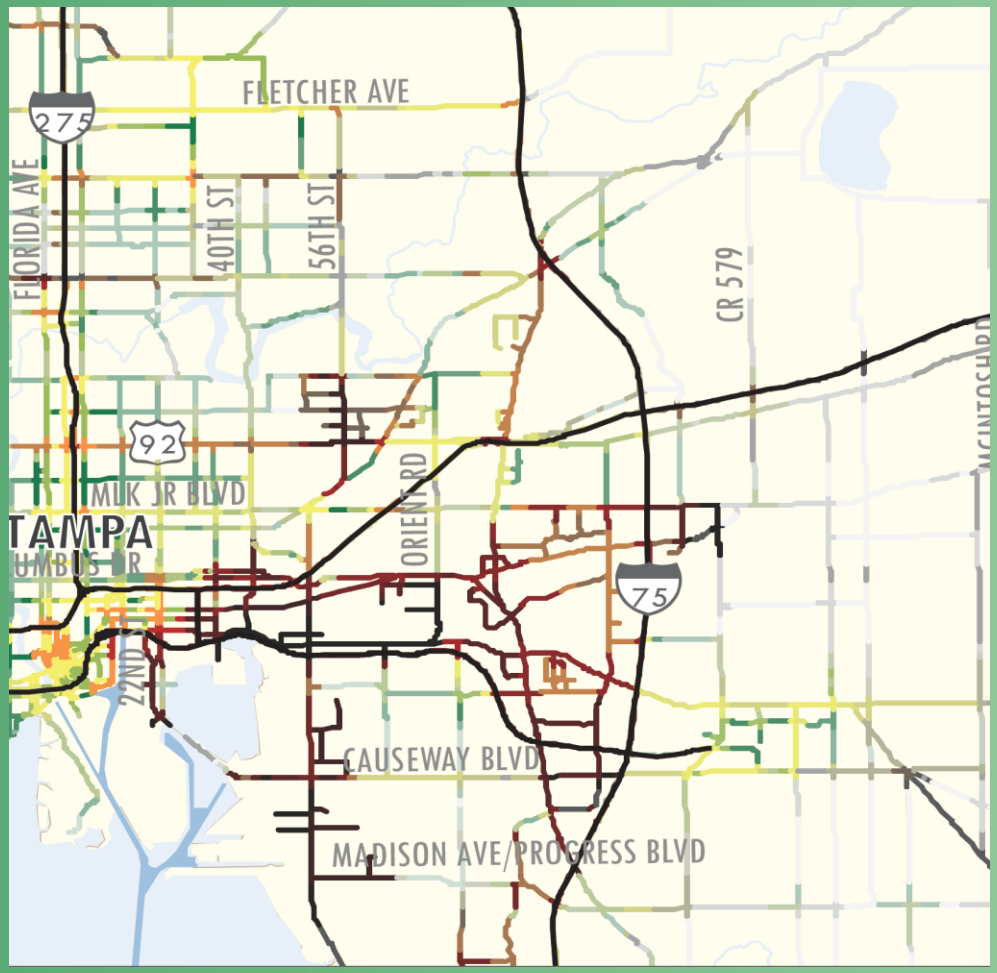
Freight Activity and Land Use Compatibility Analysis

(…or “FALUCA”)



Livability and Freight Activity in the FRDC

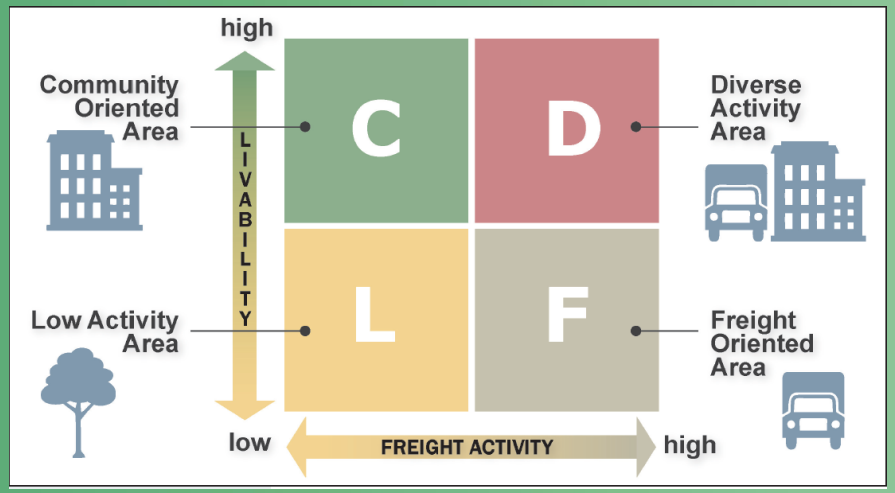




The FRDC emphasizes individual roadways and a broader "FALUCA" continuum of livability context and freight activity function.

FRDC Contents

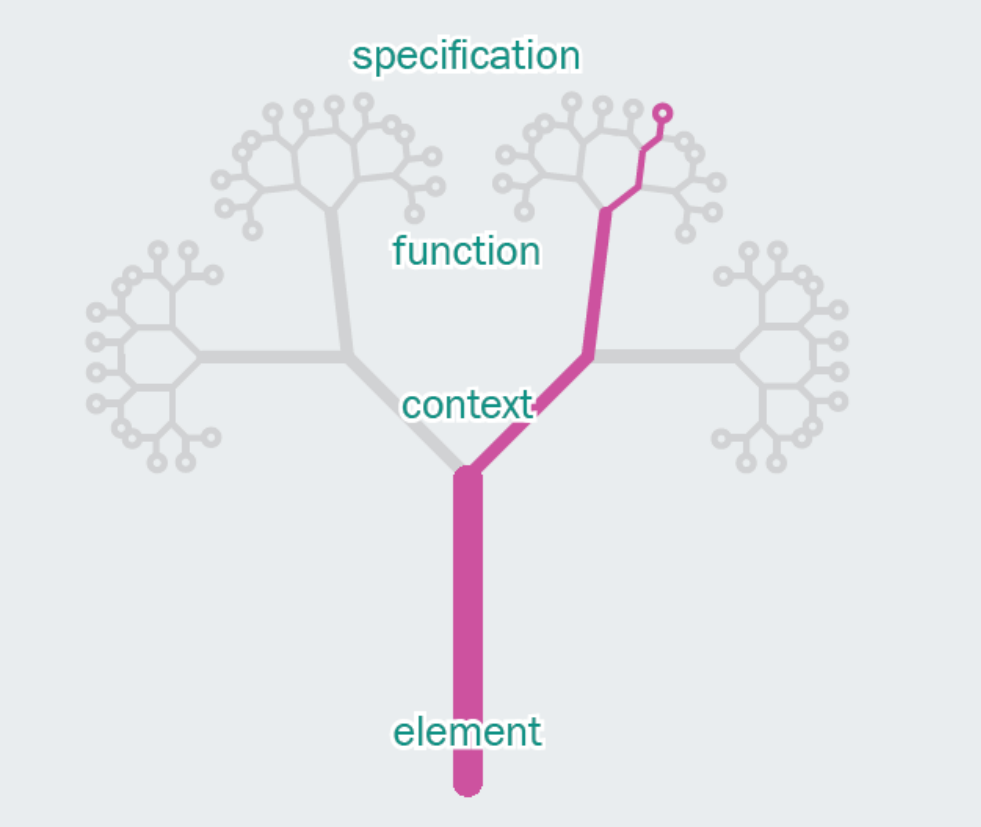
1. Purpose and applicability
2. Context and design intent
3. Design strategies
4. Design elements
5. Special cases
6. Best practices and references



FRDC Contents
1. Purpose and applicability

Relationship to other guides

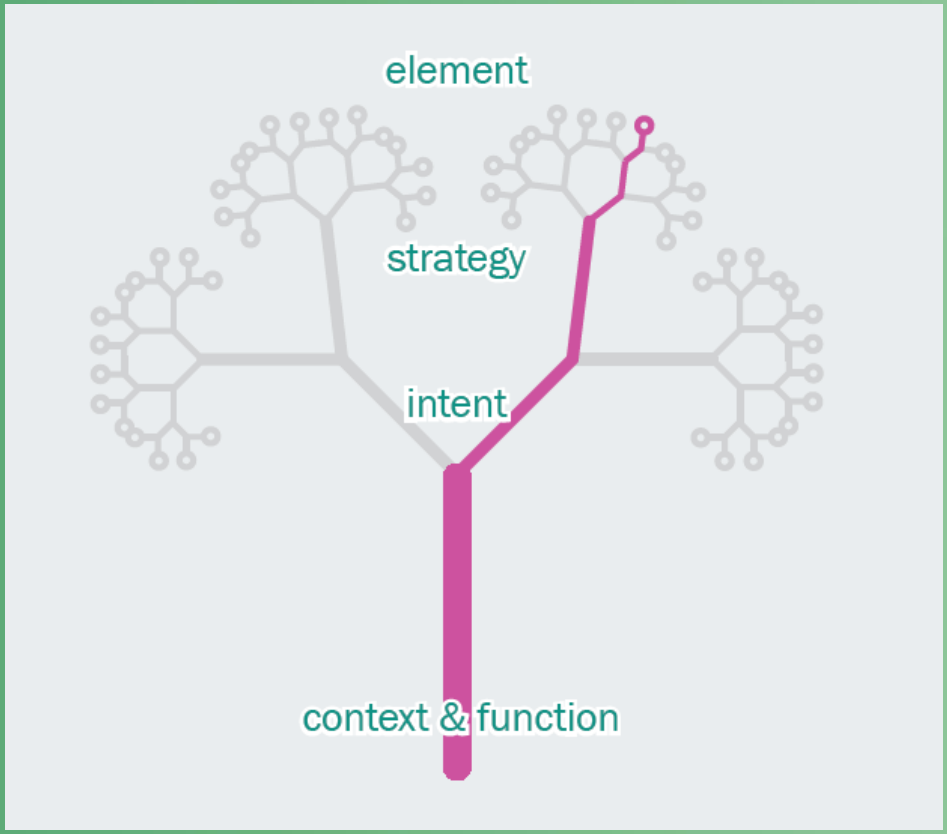
Design manuals and guides are typically organized by design element. Context and function lead to appropriate specifications



FRDC Contents
1. Purpose and applicability

Relationship to other guides

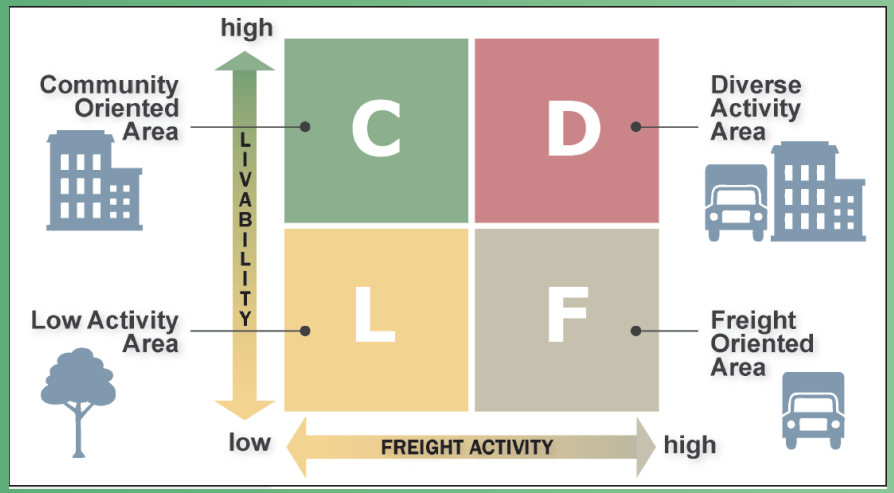
The FRDC helps designers consider how land use context and freight facility function help guide design intent, leading to the selection of appropriate strategies that influence design element specifications.



FRDC Contents
2. Context and Design Intent

Project context helps determine design intent:

1. Design Vehicle
2. Truck Turning Encroachment
3. Modal Emphasis
4. Target Speed
5. Fine Tuning Access and Mobility



New Material Highlights
Chapter 2: Context Examples

Drew Street
(SR 590)
Clearwater

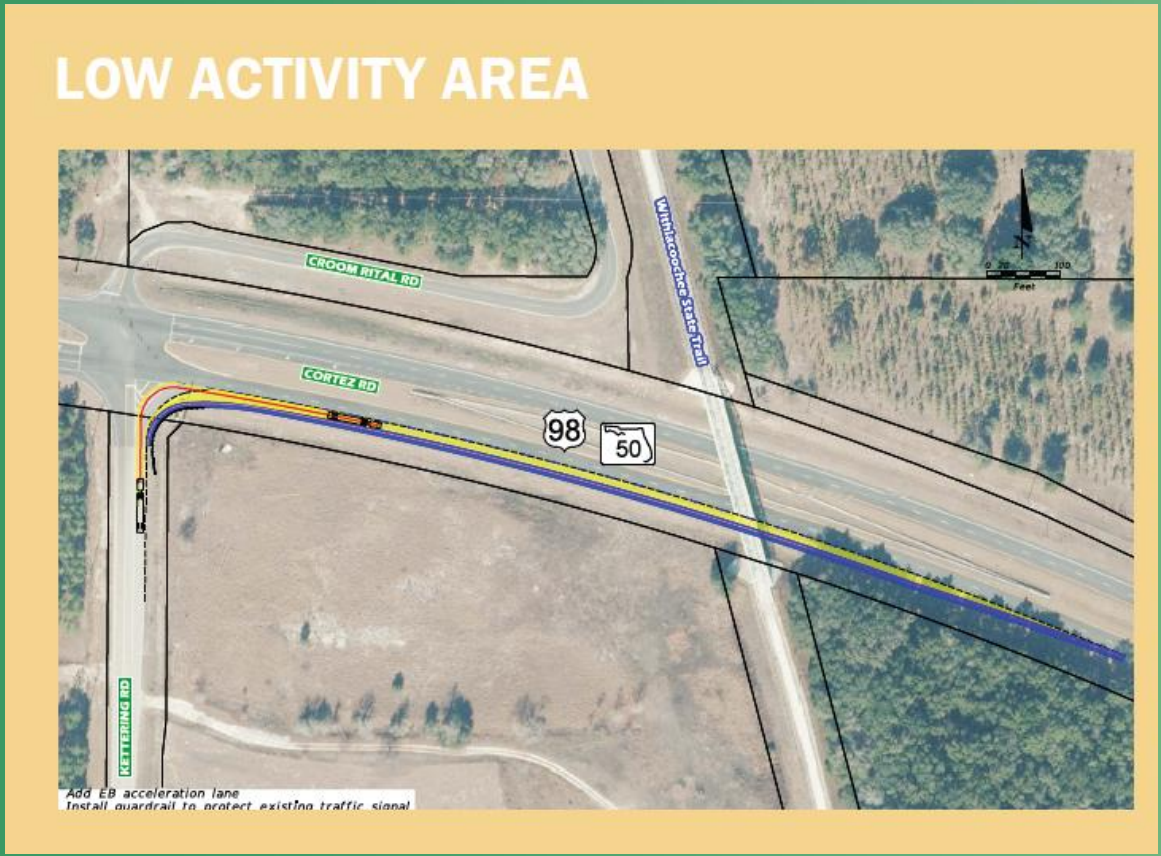
- FALUCA plus…
- Robust grid
- Small parcels (even if vacant)
- Fewer lanes
- Narrow ROW

New Material Highlights
Chapter 2: Context Examples

Hillsborough Ave (SR 580)
Tampa Airport area

- FALUCA plus…
- Sparser grid
- Larger parcels
- Access management
- Wider ROW

New Material Highlights
Chapter 2: Context Examples



Cortez Boulevard (US 98 / SR 50) Ridge Manor area

- FALUCA plus…
- No grid
- Large parcels
- “Low Activity” and “Freight Oriented” may look the same

New Material Highlights
Chapter 2: Context Examples

Jim Johnson Road
Plant City

- FALUCA plus…
- No grid
- Large parcels
- Freight intensive uses

FRDC Contents
2. Context and Design Intent

Design Vehicle

COMMUNITY ORIENTED

What: Turning movements at intersections with lower classification cross-streets have significantly lower Control Vehicle and Design Vehicle requirements

Why: Tractor-trailer movements for lower classified cross-streets are fairly rare occurrences

DIVERSE ACTIVITY

What: Turning movements at intersections with lower classification cross-streets have significantly lower Control Vehicle and Design Vehicle requirements

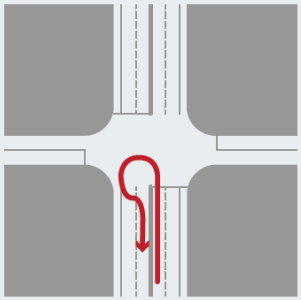
Why: Tractor-trailer movements for lower classified cross-streets are fairly rare occurrences

CROSS STREET FACILITY TYPE	DESIGNATED FREIGHT ROADWAY FACILITY TYPE			
	Limited Access Facility Ramps	Freight Mobility Corridors	Other Freight Distribution Routes	FAC Streets
Limited Access Facility Ramps	DV = WB-67			
Freight Mobility Corridors	DV = WB-67	DV = WB-67		
Other Freight Distribution Routes	DV = WB-67	DV = WB-67	DV = WB-62	
FAC Streets	DV = WB-67	DV = WB-67	DV = WB-62	DV = WB-62
Other Major Arterials	DV = WB-40 CV = WB-62	DV = WB-40 CV = WB-62	DV = WB-40 CV = WB-62	DV = WB-40
Other Minor Arterials and Collectors	DV = WB-40 CV = WB-62	DV = WB-40 CV = WB-62	DV = WB-40 CV = WB-62	DV = WB-40
Local Roads and Streets	DV = SU CV = WB-40	DV = SU CV = WB-40	DV = SU CV = WB-40	DV = WB-40

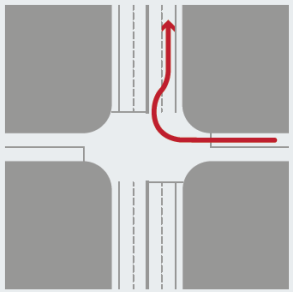
FRDC Contents
2. Context and Design Intent

Truck encroachment

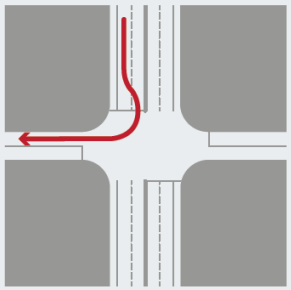
A. Encroachment into bicycle lanes or diamond (transit/HOV) lanes



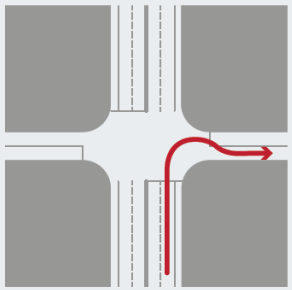
B. Encroachment into multiple receiving lanes on destination leg



C. Encroachment from multiple sending lanes from departure leg

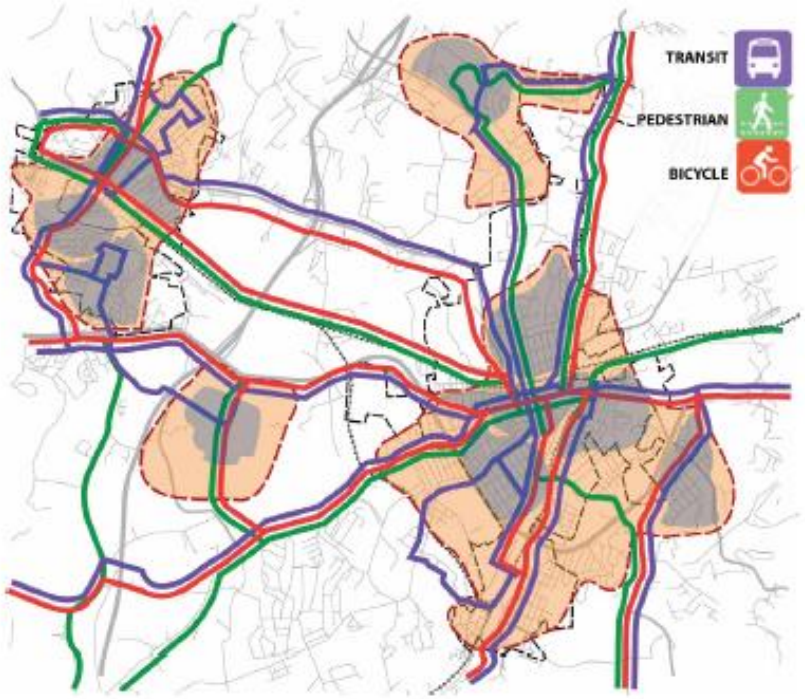


D. Encroachment into opposing traffic when lanes are clear



FRDC Contents
2. Context and Design Intent

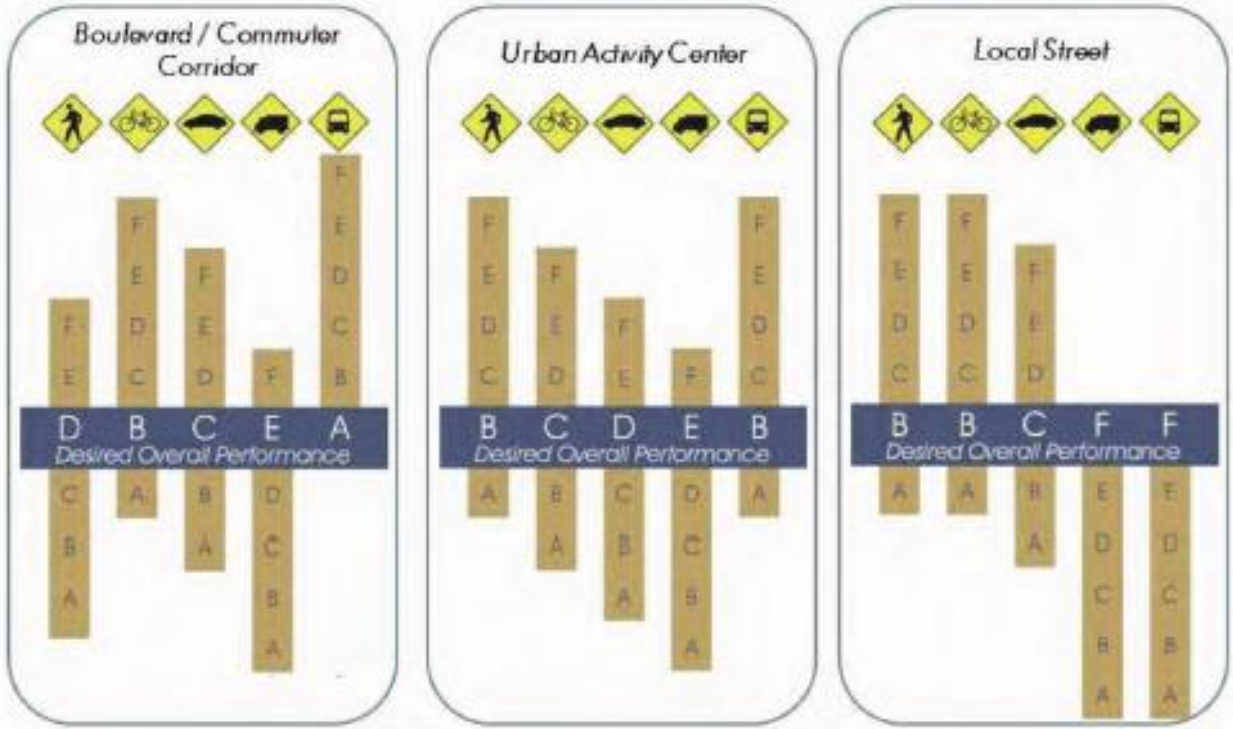
Modal Emphasis



The designation of a functional network plan for bicycles, pedestrians, and transit vehicles can help planners and designers understand appropriate modal emphases for given roadway segments. Source: Virginia Department of Rail and Public Transportation, 2013

FRDC Contents
2. Context and Design Intent

Modal Emphasis



The identification of context-sensitive quality-of-service objectives for each mode of travel is one way to consider modal emphasis. Source: Institute of Transportation Engineers, 2014

FRDC Contents
2. Context and Design Intent

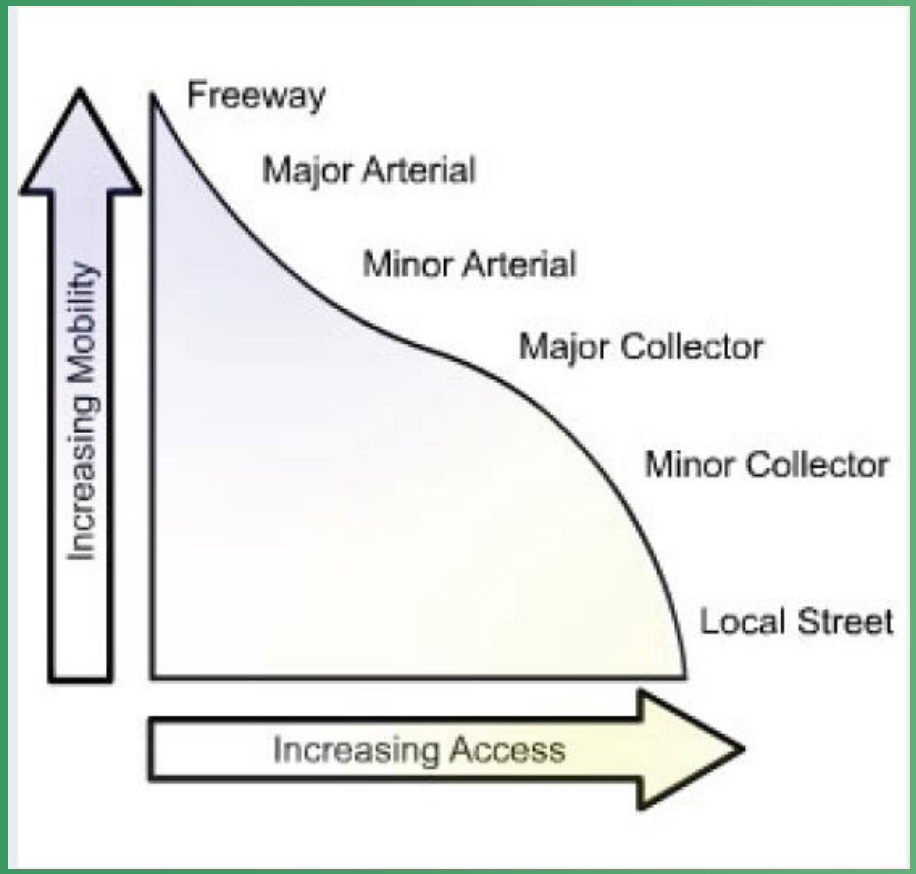
Target Speed

TARGET SPEED
may influence:

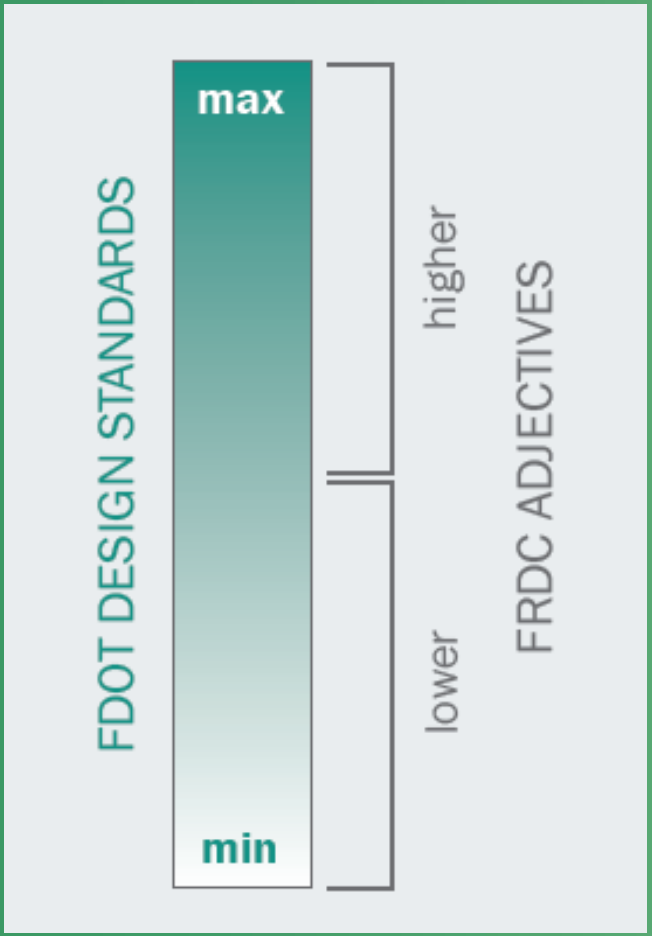
- Access management
- Bicycle Level of Service
- Advisory speed plates
- Traffic control at junctions, including selection of roundabouts as a traffic control device and signal network synchronization
- Roadside element placement (beyond clear zone, in both public and private realms)
- Gateway landscape treatments

FRDC Contents
2. Context and Design Intent

Fine Tuning Access and Mobility



FRDC Contents
3. Design Strategies



- Prototypes
- User Perspectives
- Design Nuances
- Diverse Area Considerations

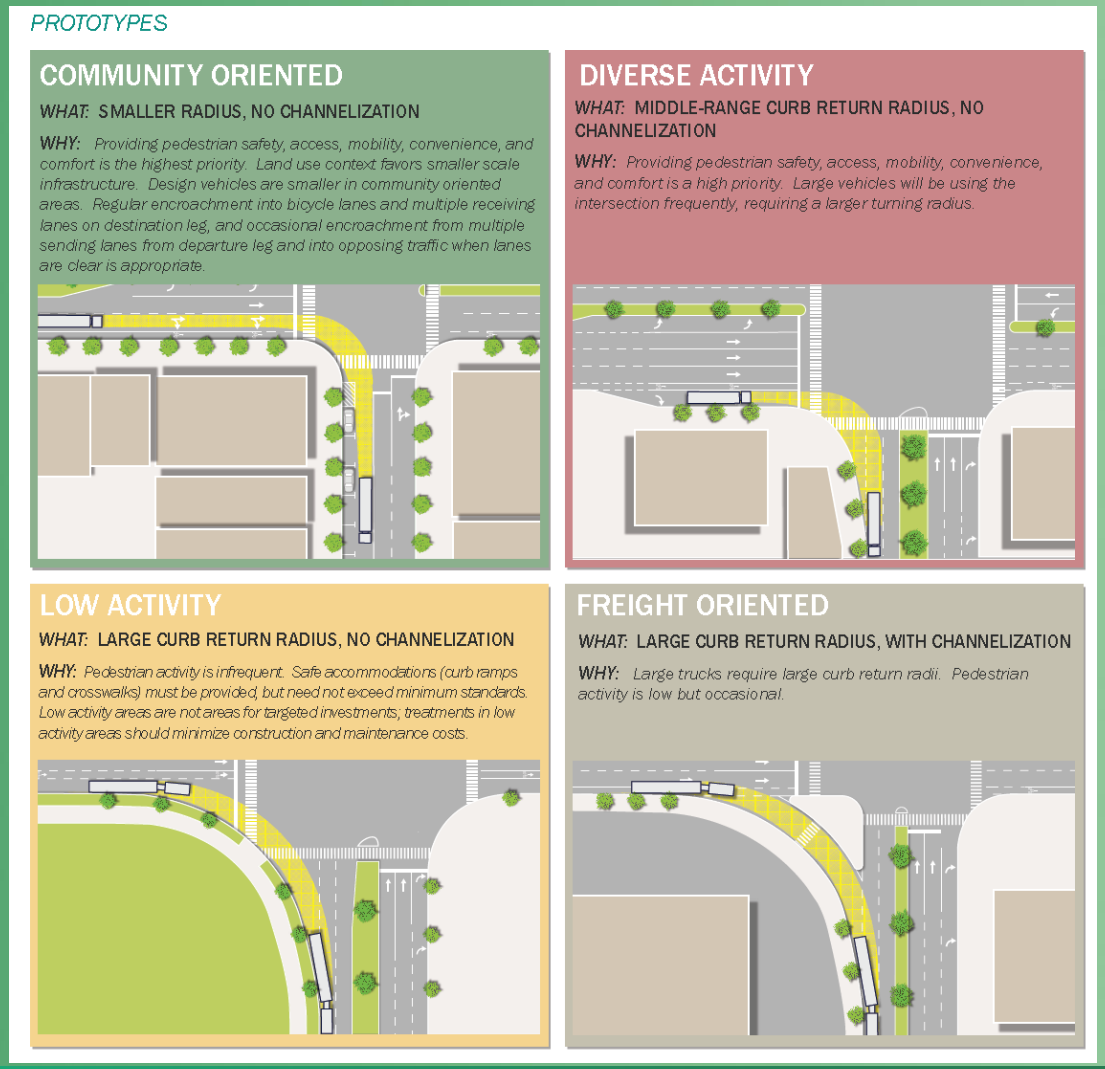
FRDC Contents
3. Design Strategies

1. Typical Section Configurations
2. Intersection Approach Configurations
3. Right Turn Treatments
4. Median Nose Treatments
5. Pavement Bulb-Outs and U-Turns
6. Access Management and Truck Parking
7. Traffic Control Devices
8. Signal Phasing

FRDC Contents
3. Design Strategies

Prototypes

What characteristics are likely to be context-appropriate?



FRDC Contents
3. Design Strategies

User Perspectives

Which user groups are likely to see as most or least beneficial?

RIGHT TURN TREATMENTS (CONTINUED)

USER PERSPECTIVES

	C COMMUNITY ORIENTED	D DIVERSE ACTIVITY	L LOW ACTIVITY	F FREIGHT ORIENTED
	Smaller radius, no channelization	Middle-range curb return radius, no channelization	Large curb return radius, no channelization	Large curb return radius, with channelization
TRUCK DRIVERS	Requires encroachment and/ or multi-point turns for large trucks.	Easily accommodates single-unit trucks, but requires encroachment for larger trucks.	Provides maximum flexibility in navigating turns.	Can provide a larger curb return radius for easier navigation through turns, but channelizing island requires attention for back wheels.
AUTO DRIVERS	Slows turning speeds.	Easily navigable for passenger cars and SUVs.	Encourages high turning speeds and allows passing on the right in shared through/right turn lane.	Provides clear path for turning vehicles and allows higher turning speeds.
BUS TRANSIT DRIVERS	May require encroachment on destination leg.	Minimal encroachment needed. Provides curbside space for bus stop in receiving lane.	Easily navigable for turns, but requires transit stop to be located farther from intersection corner.	Easily navigable for turns, but requires transit stop to be located farther from intersection corner.
PEDESTRIANS	Shortens crossing distance and simplifies crossing manuever.	Moderate crossing distance.	Lengthens crossing distance and encourages vehicles to make right turns on red	Channelized island can provide pedestrian refuge, but increased curb radius increases overall crossing distance.
BICYCLISTS	Slows vehicle turning speeds, thereby increasing bicyclist safety.	Encourages moderate vehicle turning speeds, but allows bicyclists to be flexible in lane positioning.	Encourages high vehicle turning speeds and complicates bicycle lane positioning.	Island can provide better waiting space for bicyclists proceeding straight through the intersection, but complicates interaction between right-turning motorized vehicles and right-turning bicyclists.
ADJACENT PROPERTY OWNERS	Maximizes property frontage and requires minimal easements for right-of-way.	No notable adverse or positive effects.	Requires maximum easement on corner property for right-of-way and discourages walk-by customers.	Requires maximum easement on corner property for right-of-way.

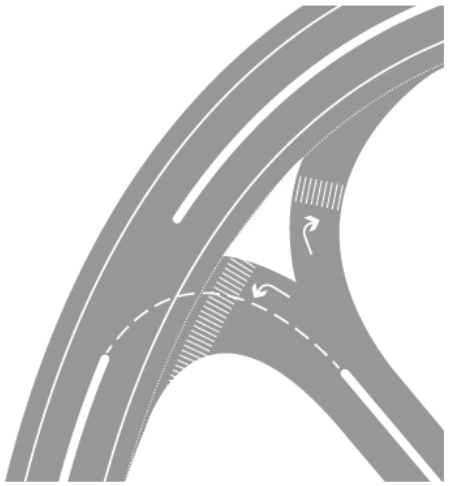
KEY: Effect On User Group

positive | mixed | negative | neither positive or negative

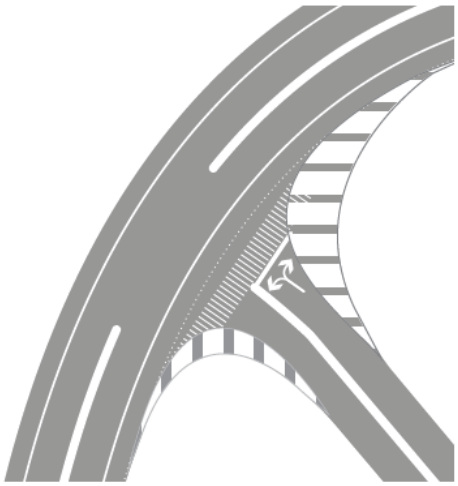
FRDC Contents
3. Design Strategies

Design Nuances

What tradeoffs are most likely appropriate in different context areas?



Channelization treatment for skewed angle intersections in diverse activity areas.

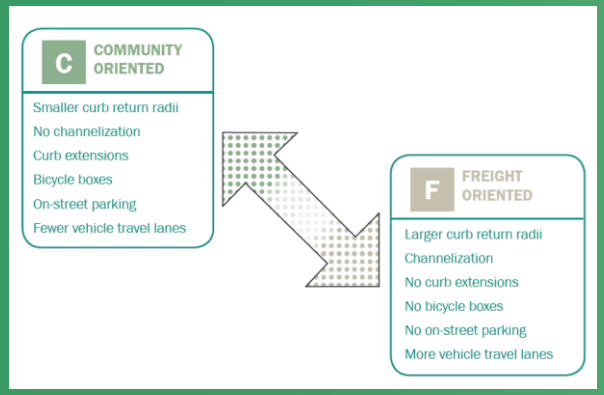


Alternative treatment for skewed angle intersections in community oriented areas.

- THREE CENTERED COMPOUND CURVES more closely approximate the turning path of a large vehicle. They require less right-of-way area and reduce the overall pedestrian crossing distance as compared to a simple curve that accommodates a certain design vehicle. This treatment may be particularly appropriate for diverse activity areas.
- CURB EXTENSIONS are desirable in community oriented areas because they reduce the overall pedestrian crossing distance, but can pose additional obstacles for large turning trucks because they decrease the effective turning radius.
- BICYCLE LANES and on street parking lanes can increase the effective turning radius for right turns without increasing the curb return radius.
- MOUNTABLE CURBS can accommodate large vehicles infrequently at small intersections, but are generally not recommended. They can encourage more frequent encroachment, and introduce conflicts between turning trucks and pedestrians waiting at intersection corners.

Diverse Area Considerations

How Do I Know
WHICH END OF THE SPECTRUM TO LEAN TOWARDS?



Lean Towards
COMMUNITY *if:*

- The approach roadway is not on the regional freight mobility network
- The cross street has more than one lane in each direction – allows for more encroachment and fewer other design interventions are needed to accommodate large trucks
- Driveways and curb cuts are frequent and/or close to the intersection
- Vehicle access is oriented to the rear with minimal setback

Lean Towards
FREIGHT *if:*

- The approach roadway is on the regional freight mobility network
- The cross street has only one lane in each direction – allows for less encroachment and more other design interventions are needed to accommodate large trucks
- Roadways (both approach and cross street) have managed access points
- Vehicle access is oriented to the front with parking lots in front of the building

Cross-reference to Design Strategies

ROUNDABOUTS

User perspectives regarding roundabouts are generally very context-sensitive. For pedestrians and bicyclists, roundabouts can be particularly effective in creating a more comfortable operating environment on low-speed, low-volume roadways. Many motorists benefit from roundabouts in moderate-volume situations where delays are substantially reduced and safety improved compared to stop-control or signal-control. Truck drivers can similarly benefit from reduced delays, particularly where the cost of coming to, and accelerating from, a full stop can be eliminated; but care must be taken to ensure the roundabout design accommodates large vehicles. Bus drivers can also benefit from reduced delays, although the sway caused by roundabout traversal typically has a more adverse effect on passenger comfort than does a stopping and starting maneuver. The perception of adjacent property owners is location and use-specific: roundabouts typically require more right-of-way than standard intersections at the immediate junction, but less right-of-way upstream due to the ability to reduce turn lane lengths. Specific considerations regarding roundabouts are discussed in the following Design Strategies:

> Design Strategy 1: Typical Section Configurations

> Design Strategy 5: Pavement Bulb-Outs and U-Turns

> Design Strategy 7: Traffic Control Devices

Chapter 5: Special Cases

Arterial interchange treatments often serve as a boundary between context areas

- Campus settings
- TDLC projects
- Arterial interchanges
- One-way streets
- At-grade RR x-ings
- Drawbridges
- Design variances
- Maintenance of traffic

New Material Highlights
Chapter 6: Relevant sources

- NCHRP / NCFRP research
- State / local guidance (i.e., MassDOT, WSDOT, Fairfax VA, Portland OR)
- Local best practices, success stories, and lessons learned

New Material Highlights
Chapter 6: Bibliography

BIBLIOGRAPHY

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Next steps

- Draft FRDC document outreach
  - Broader District 7 / consultant review
  - Review of Freight Mobility Intersection Analysis concepts; how does the FRDC affect outcomes?
  - Inter-District and Central Office coordination
  - Local/regional agency coordination

Next steps

- Document maintenance
  - FALUCA map update process
  - PPM / PD&E manual coordination
  - Staff training and feedback
  - FRDC revision process (web-based?)