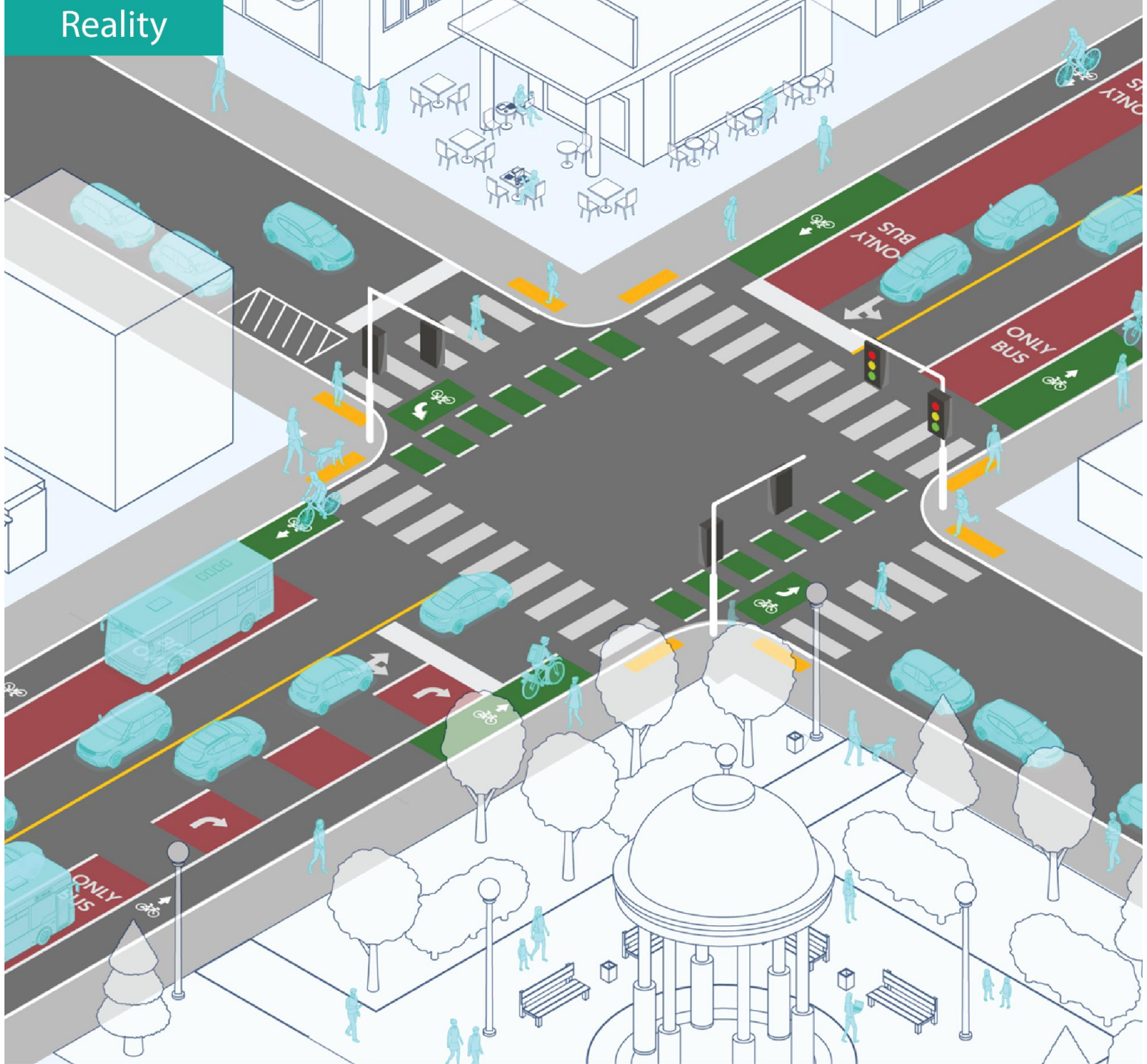
# Digital Representation of Infrastructure

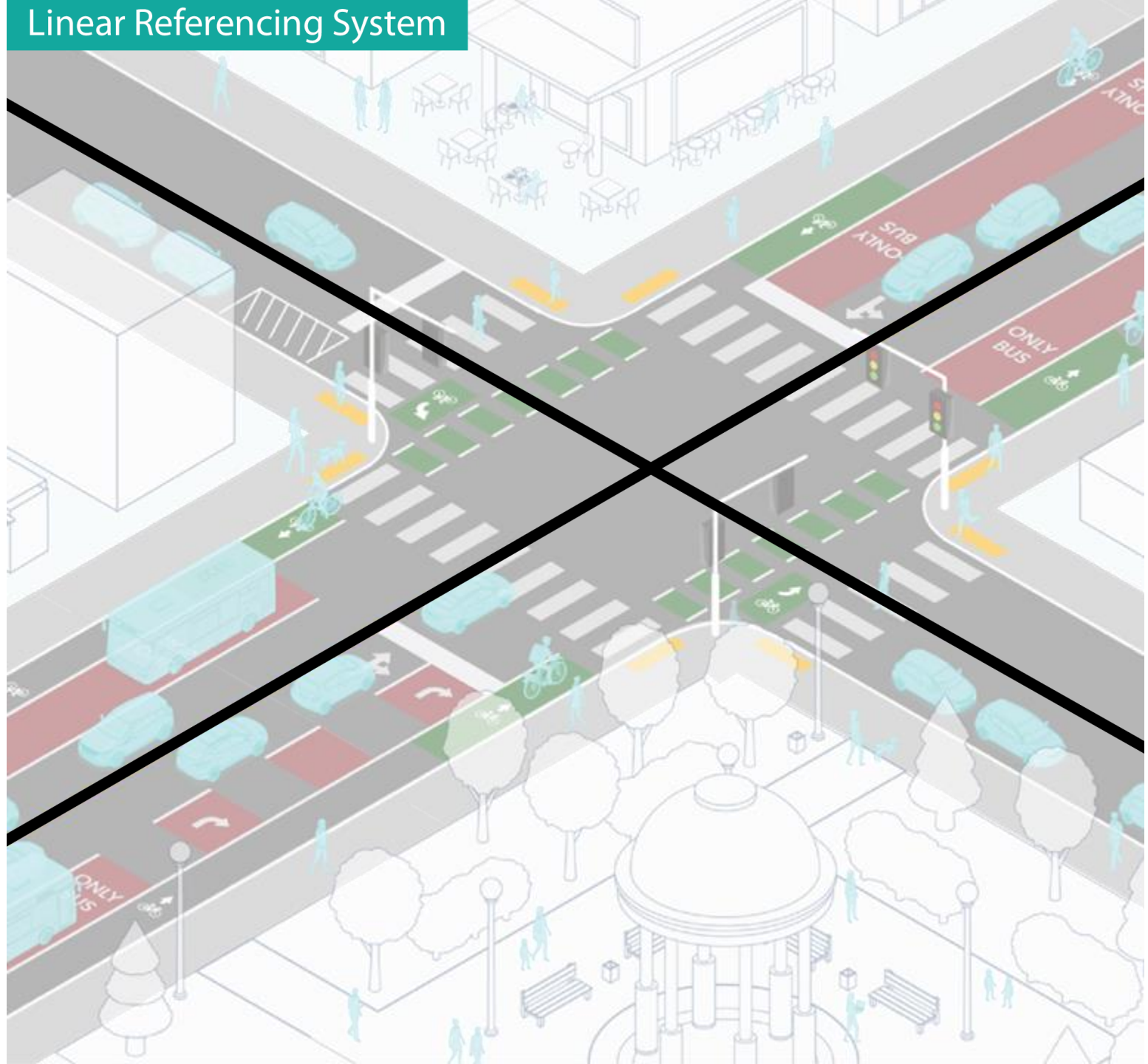
## Framing the Spectrum of Options

November 2024

U.S. Department of Transportation
Volpe Center


Reality
ONLY BUS
ONLY BUS
ONLY BUS

# Linear Referencing System



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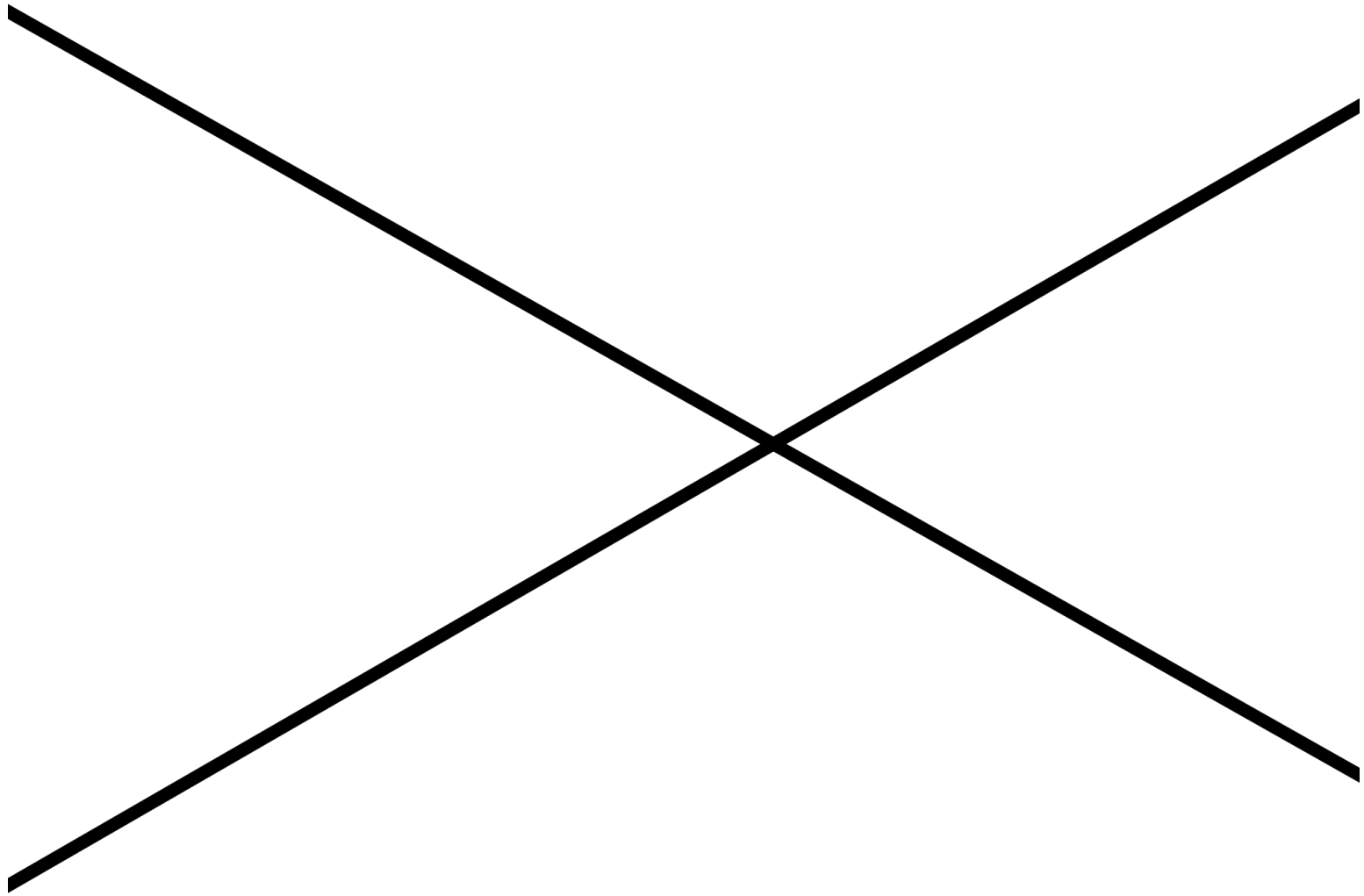

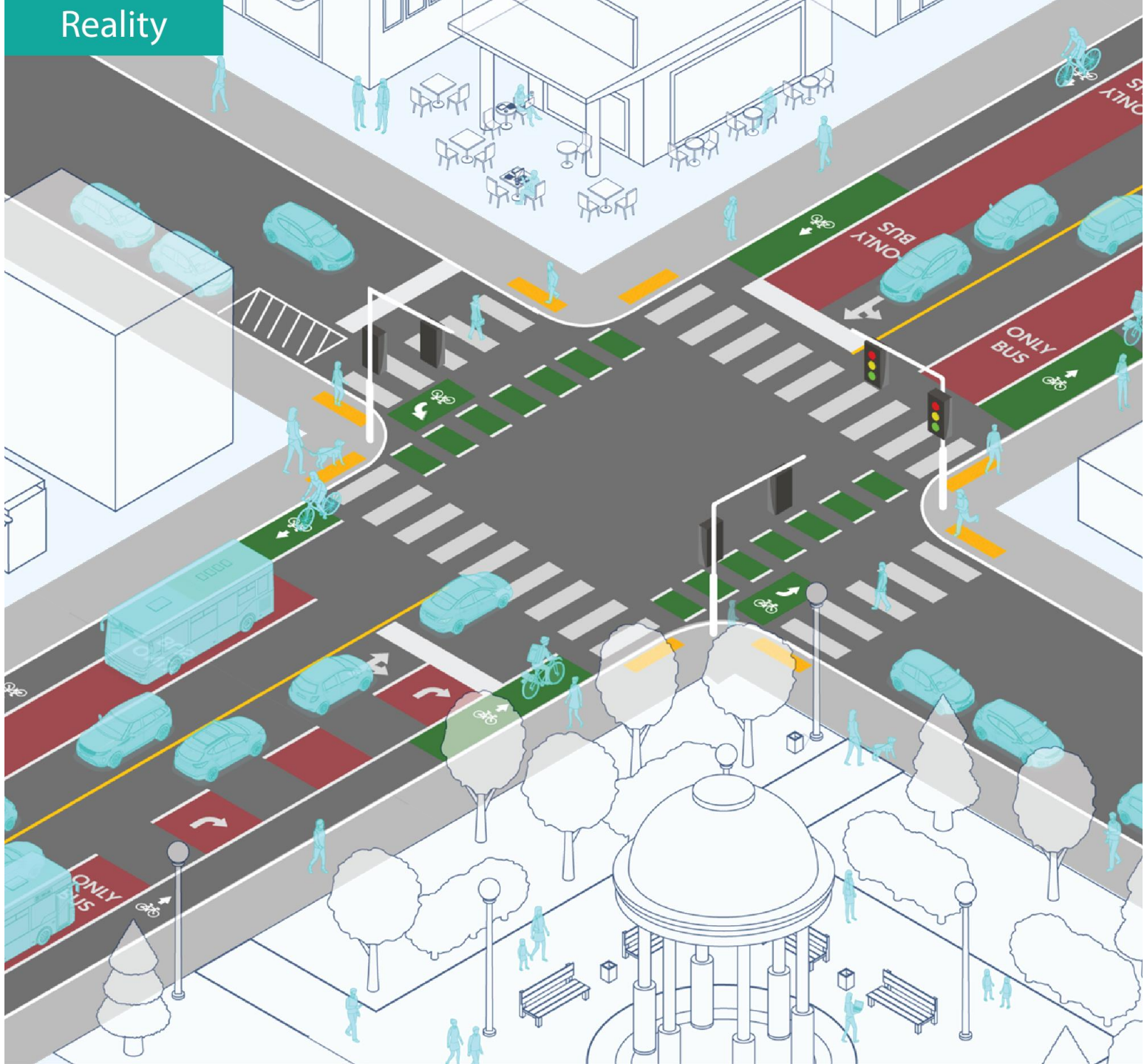
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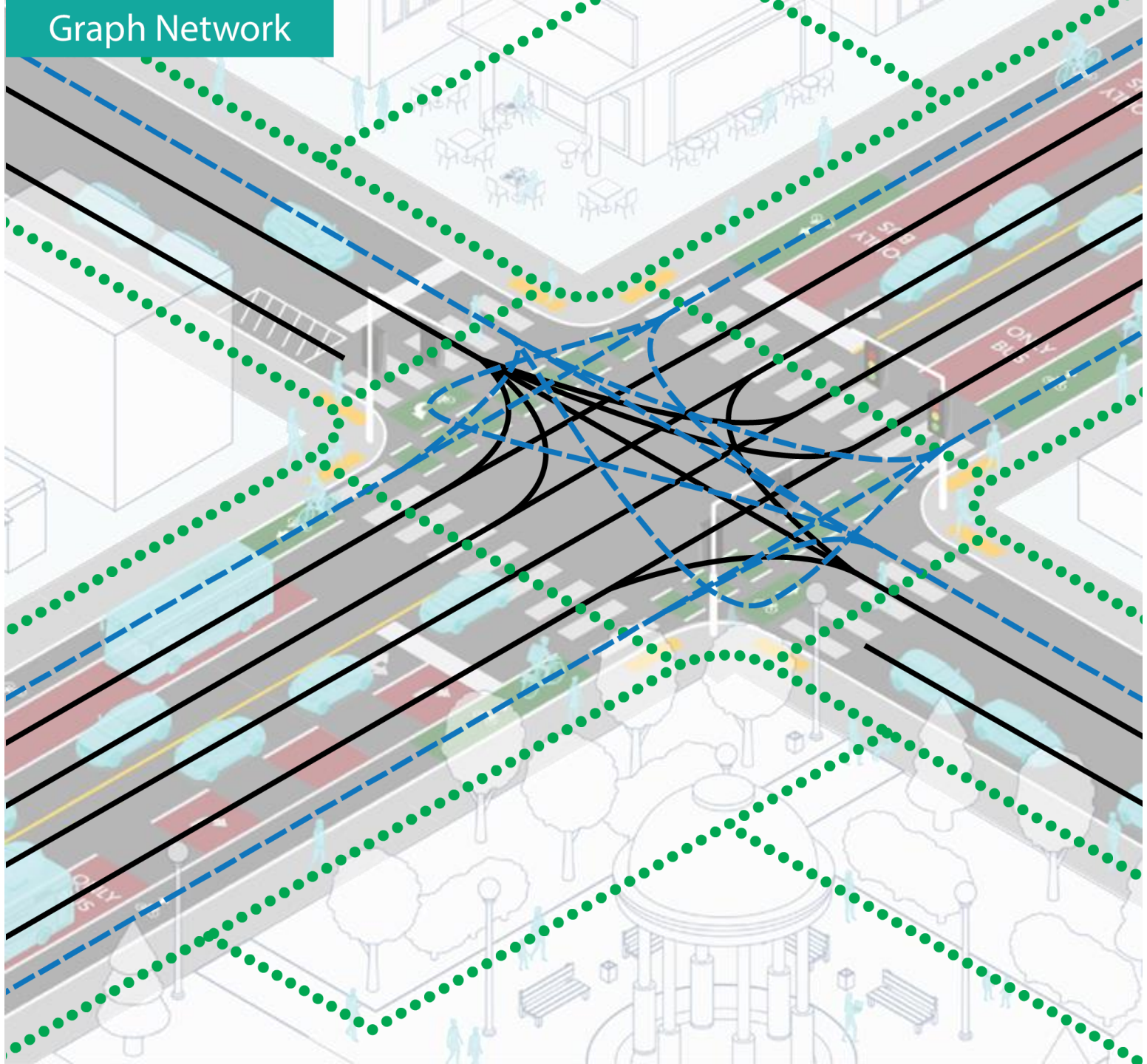
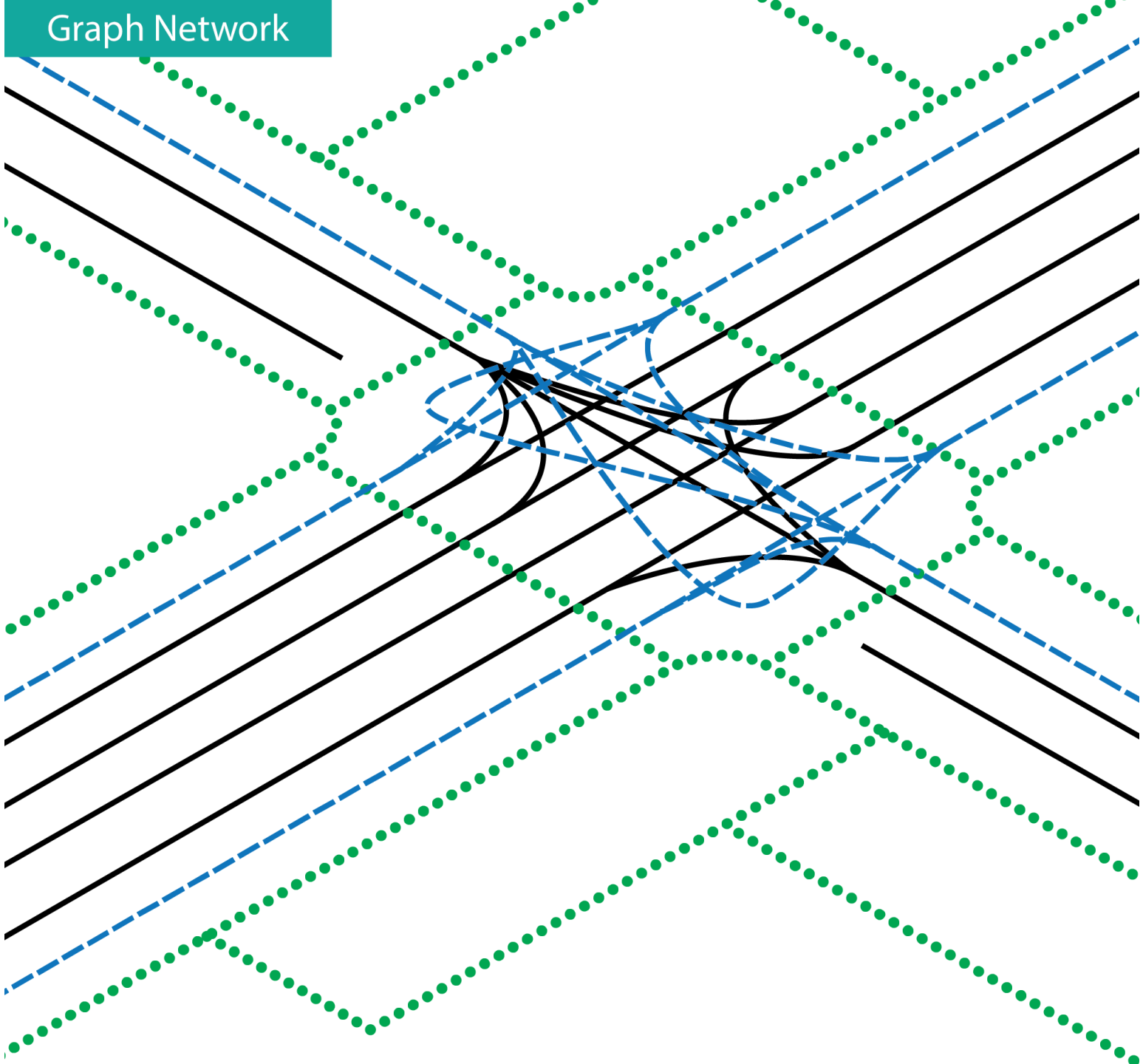

Graph Network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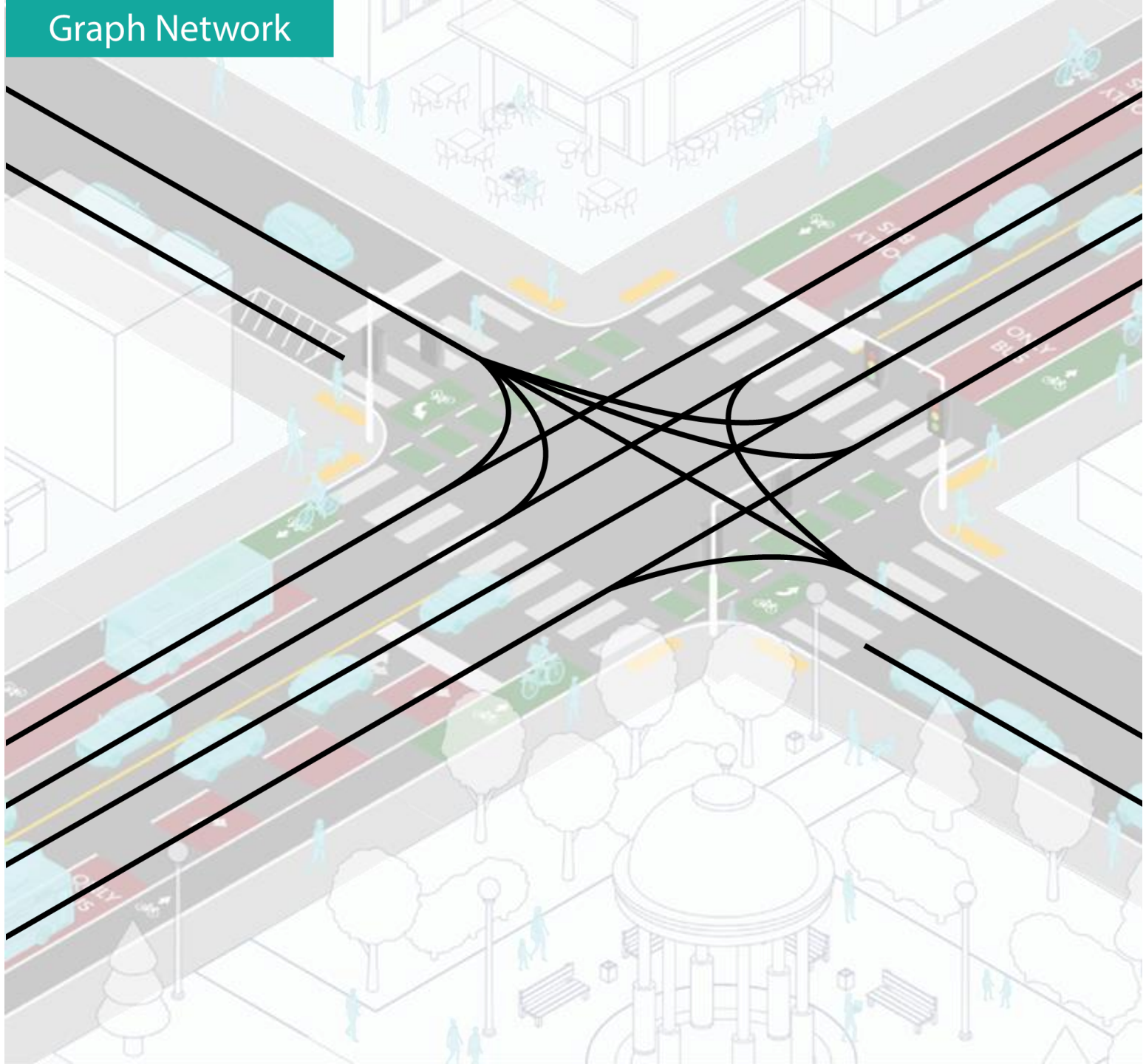
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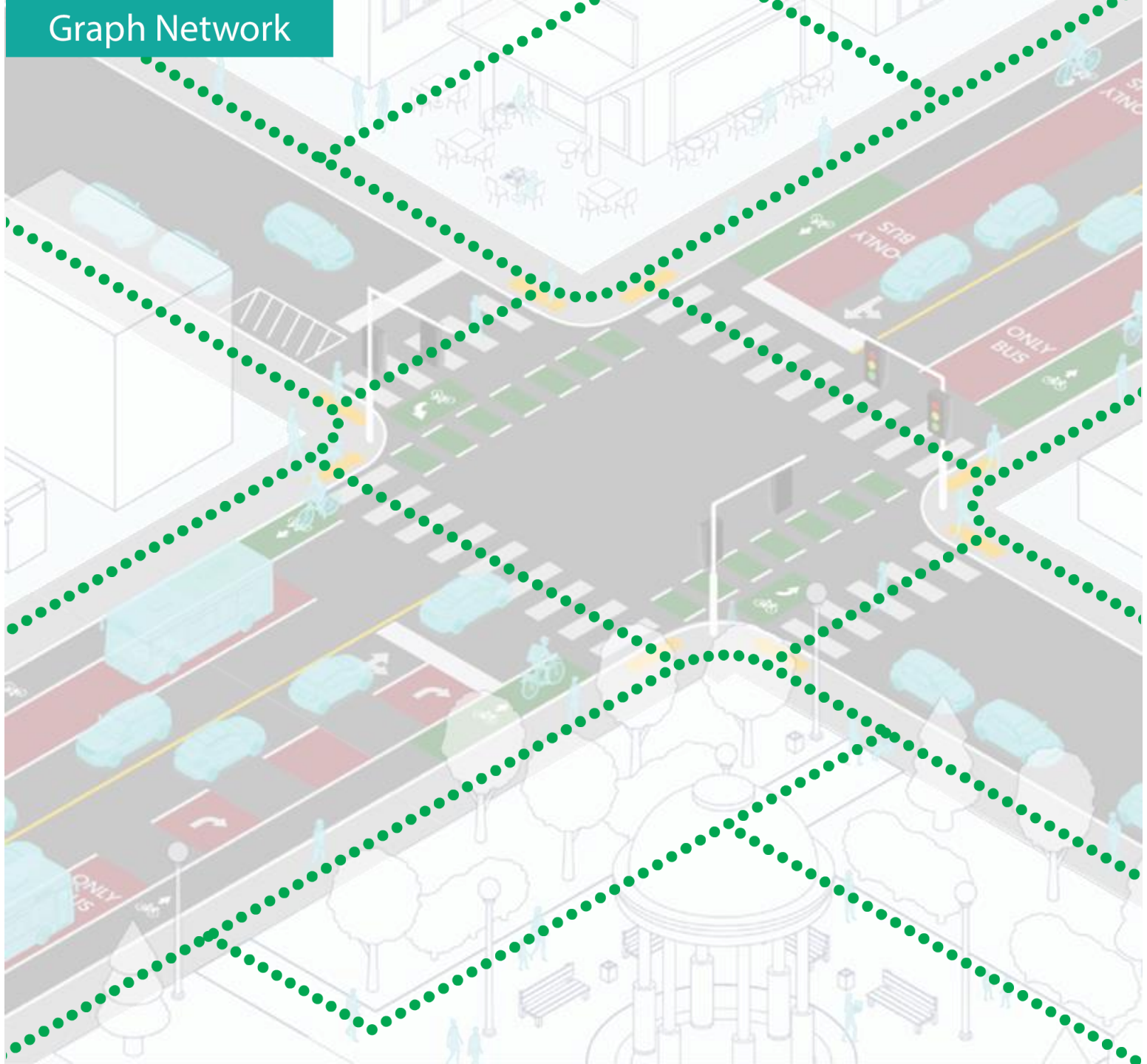
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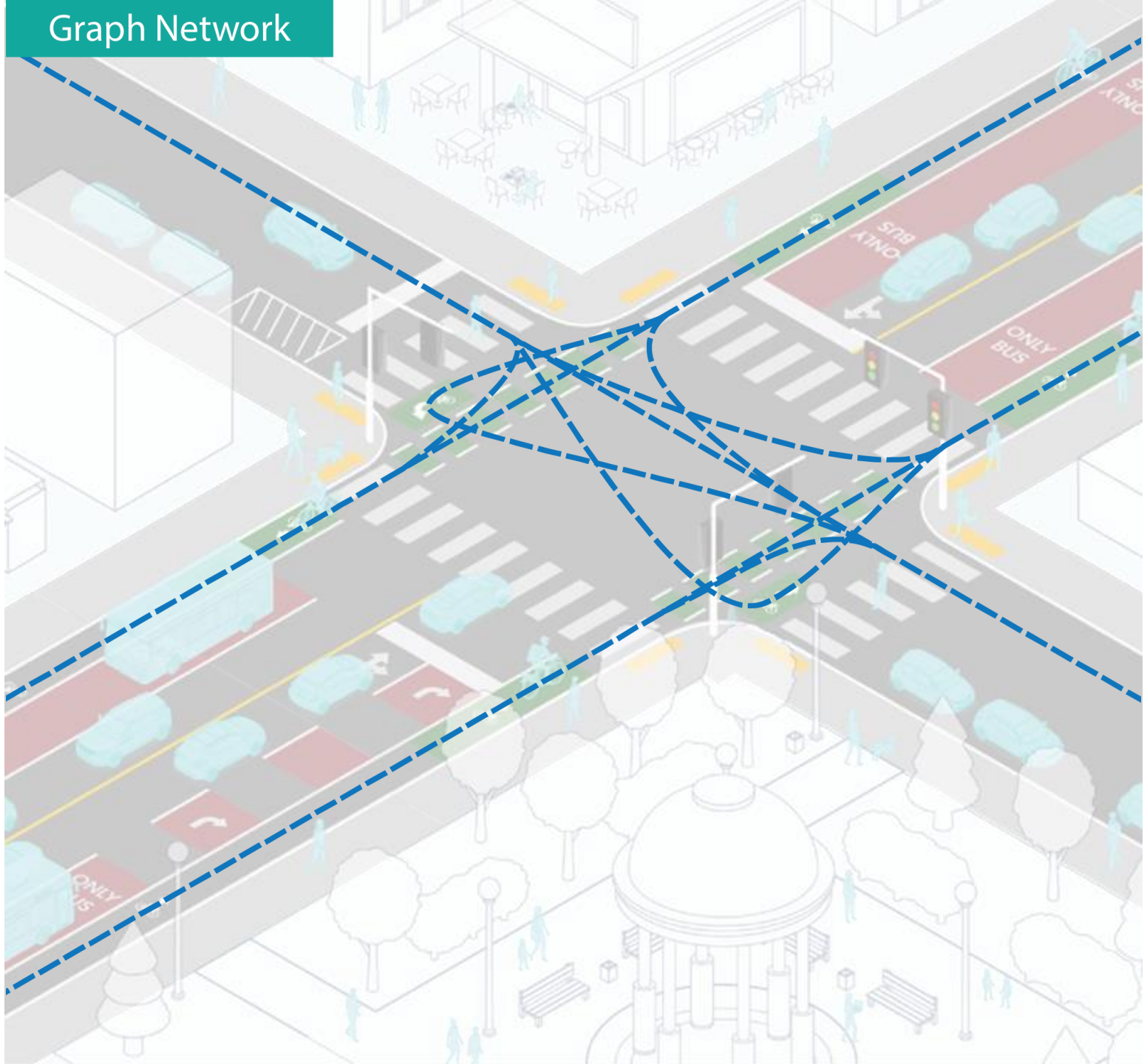
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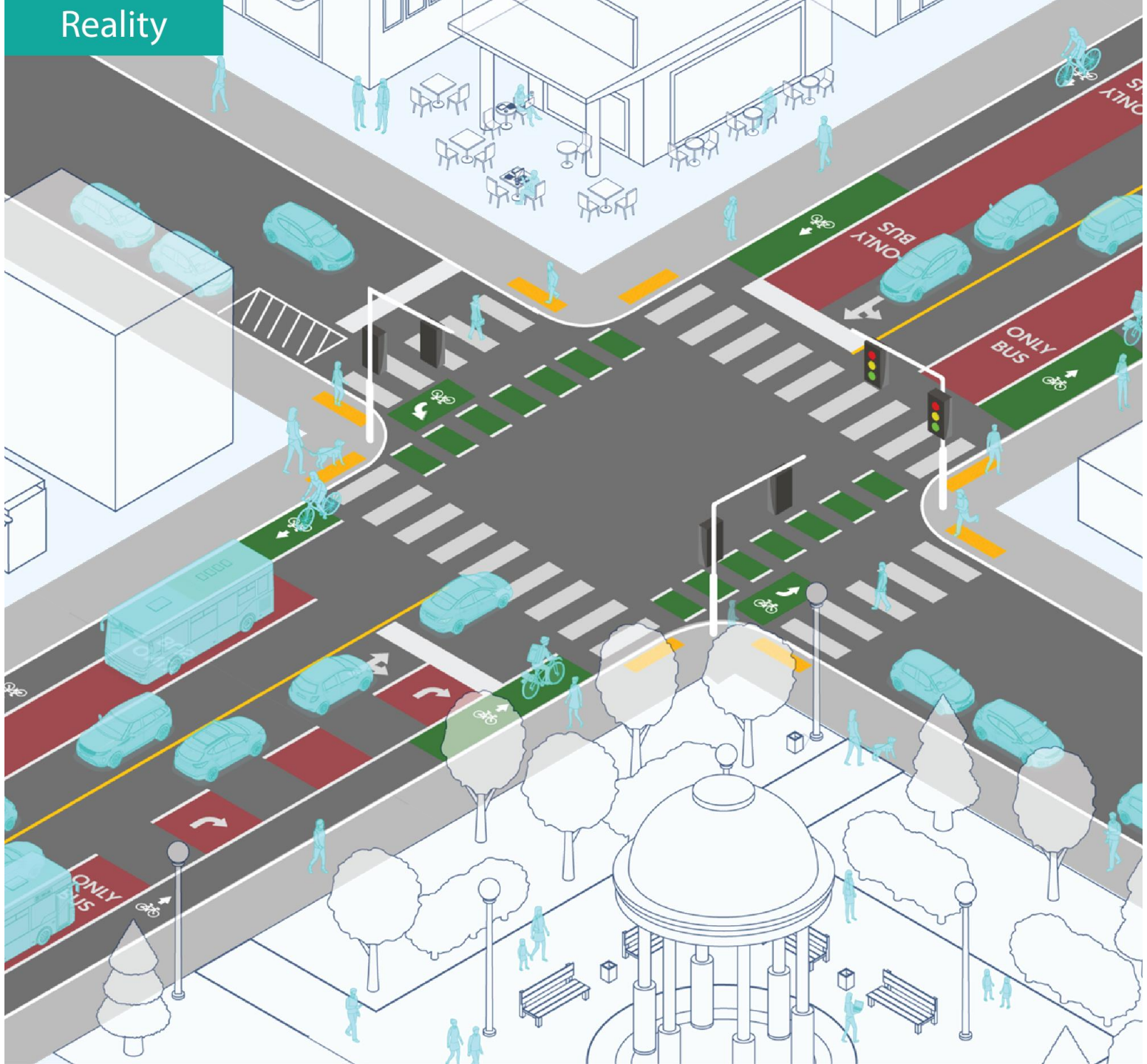
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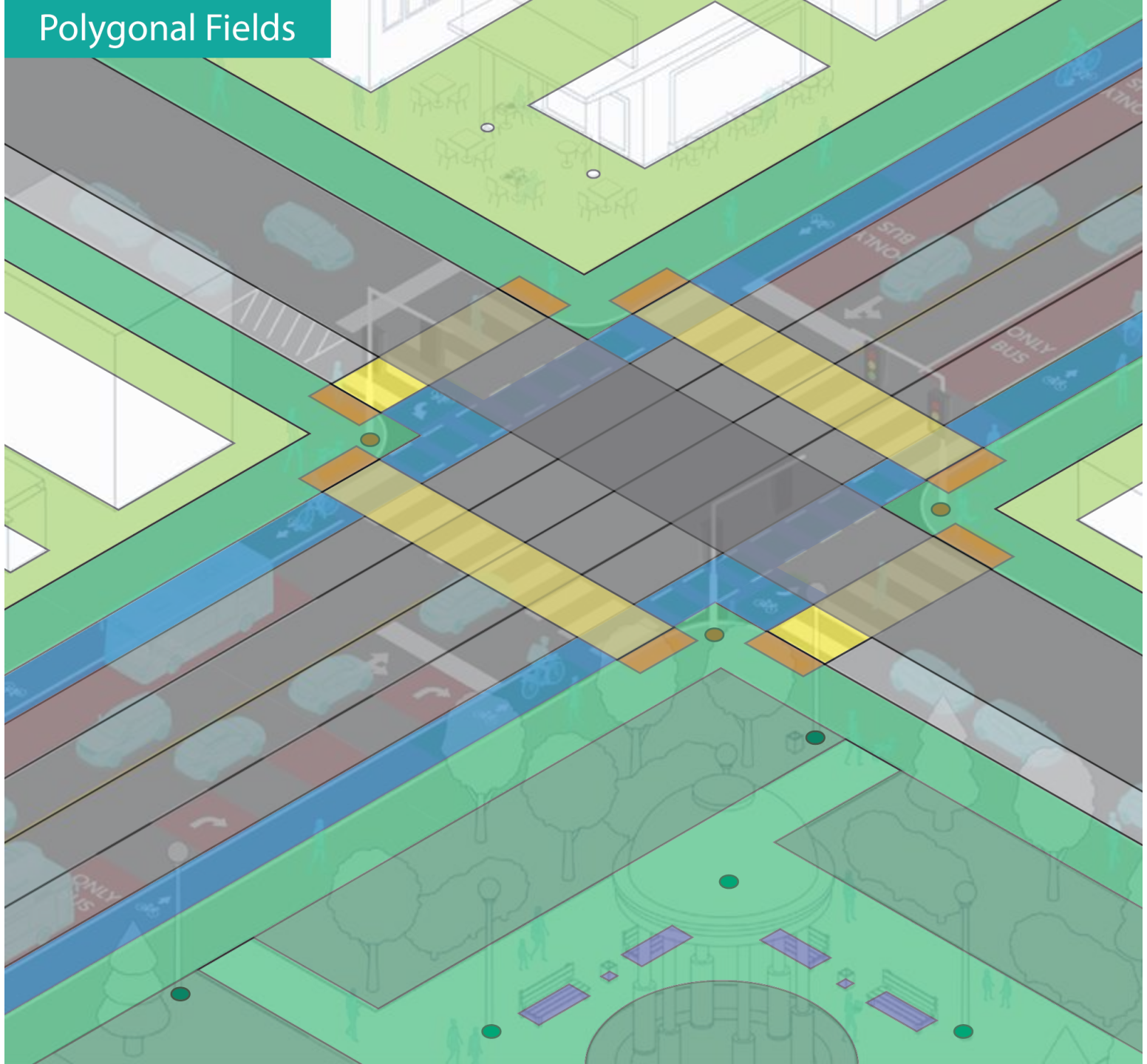
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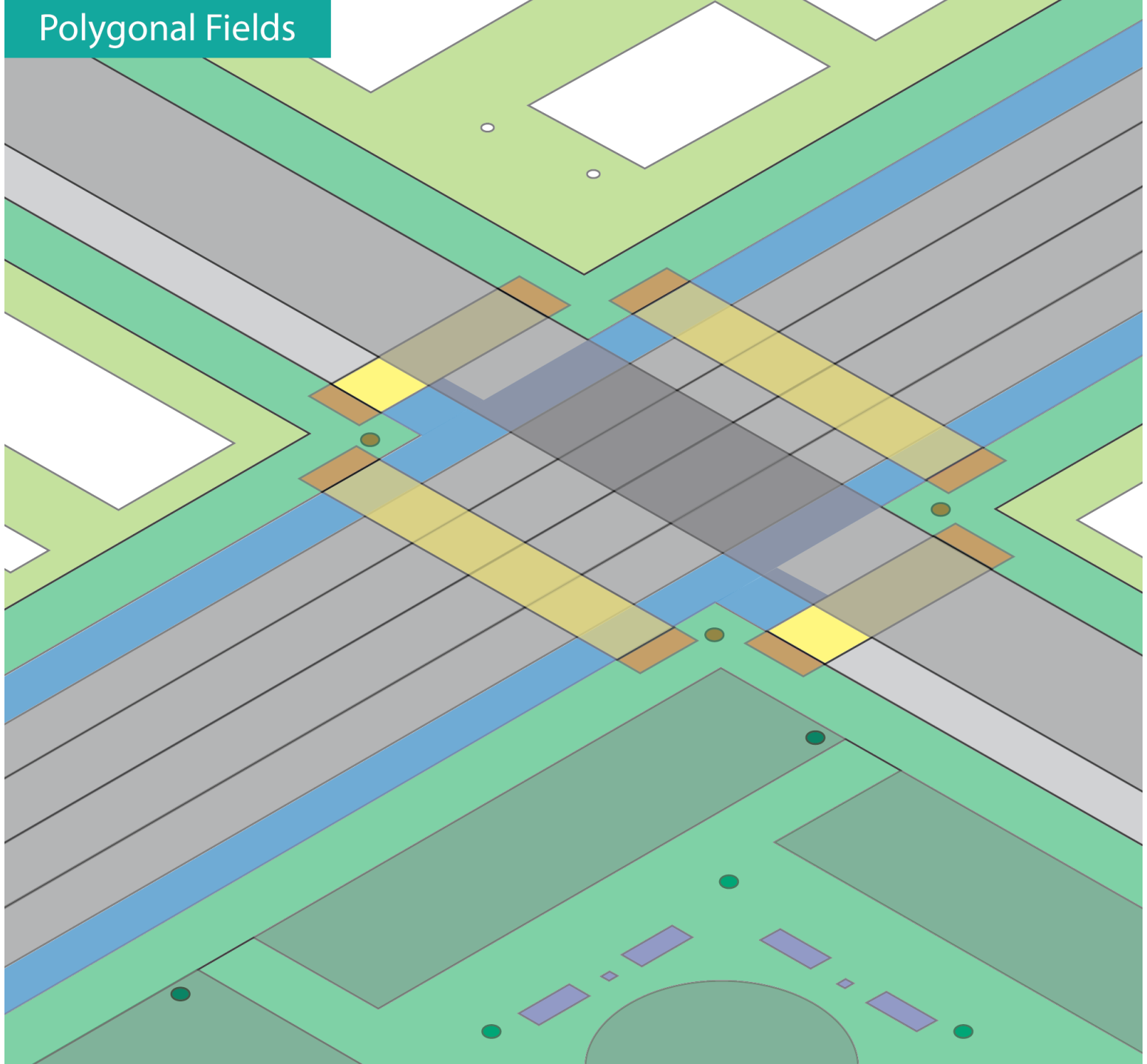
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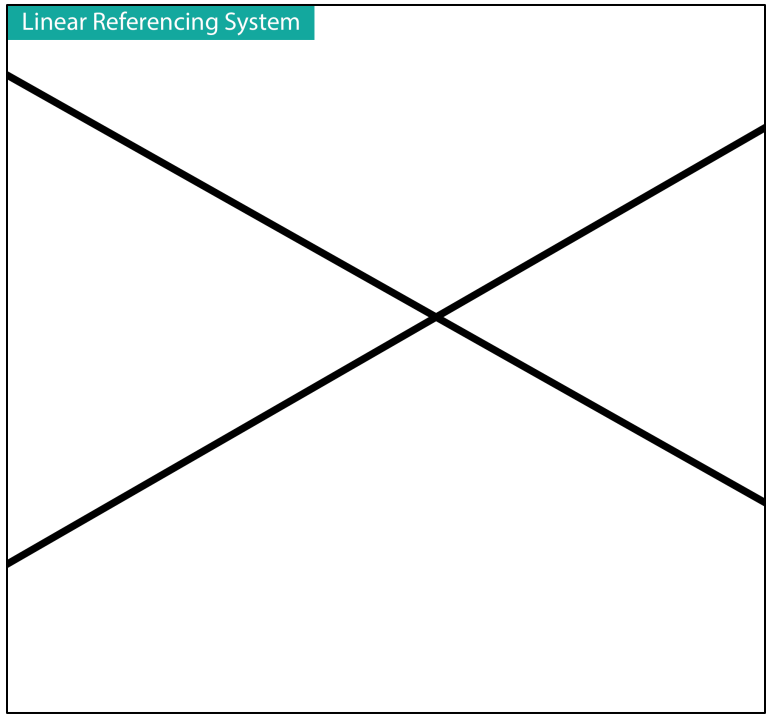
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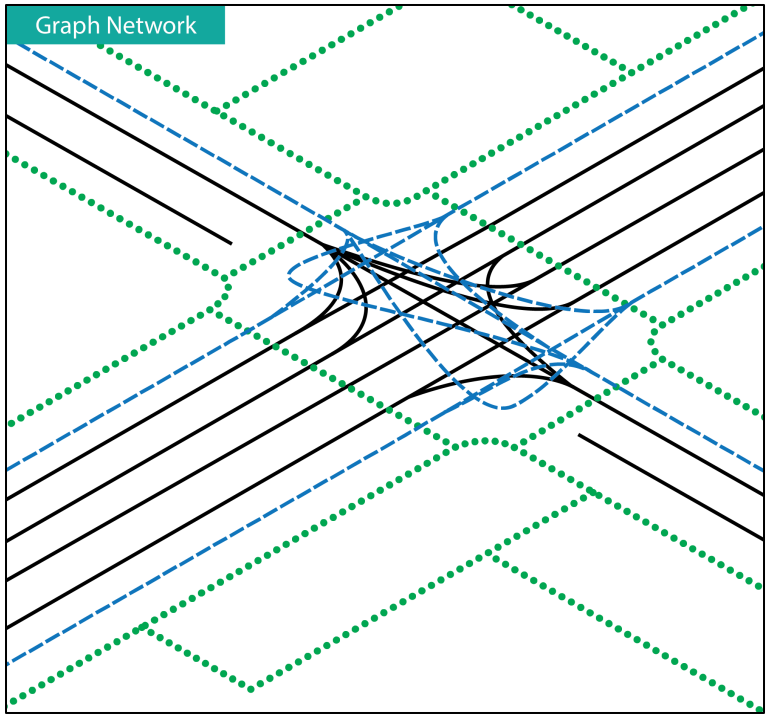
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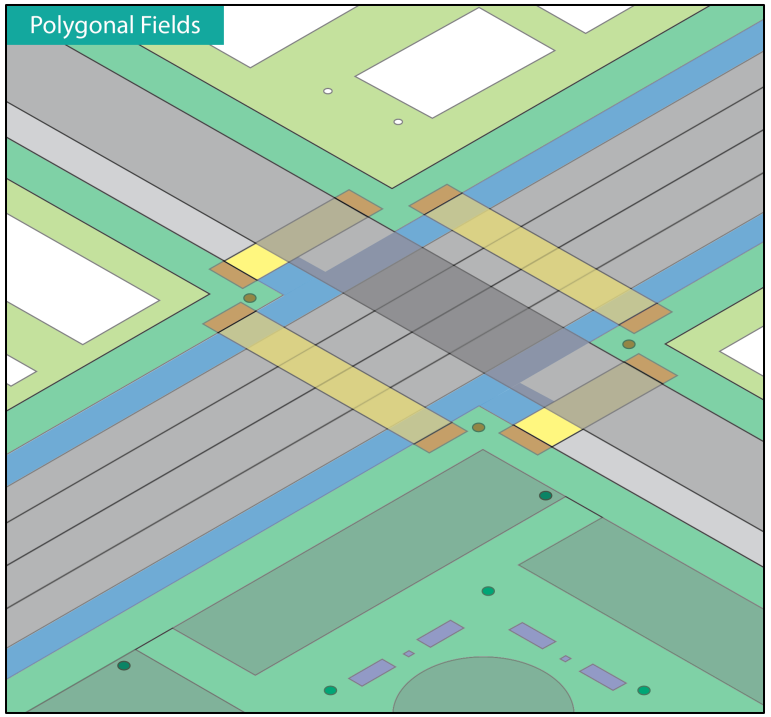
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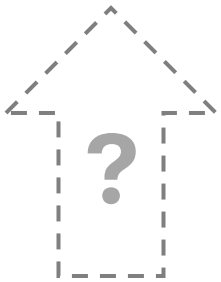
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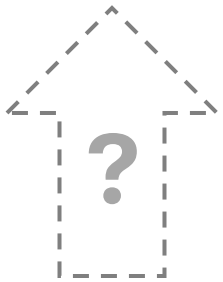
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State DOT

MPO/RPO

Technologist

Asset Management

Long-Range Plannin

County

Transit Agency

Municipality

Researche

Consultant

Network Analysis

Programming

Prioritization

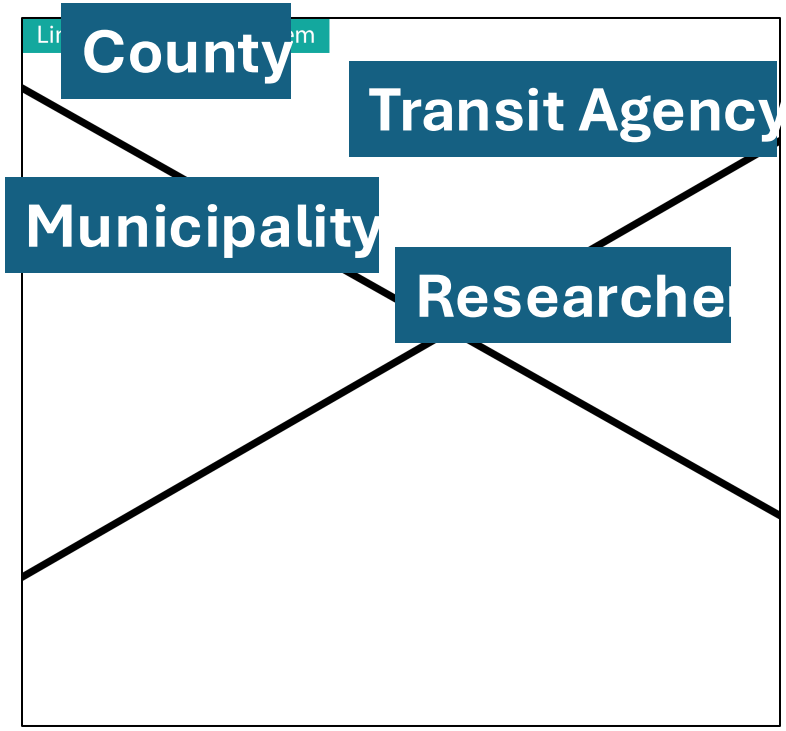
Advocate

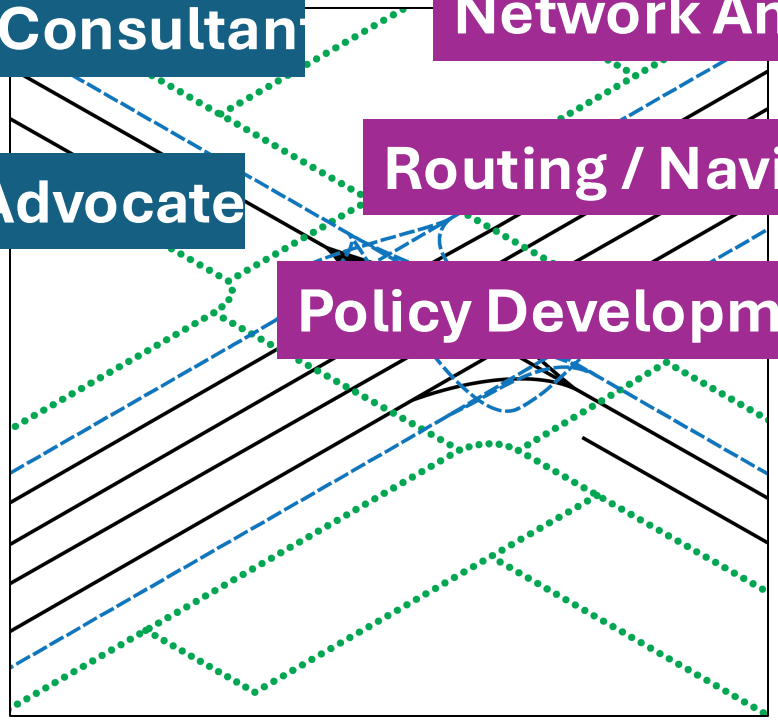
Routing / Navigation

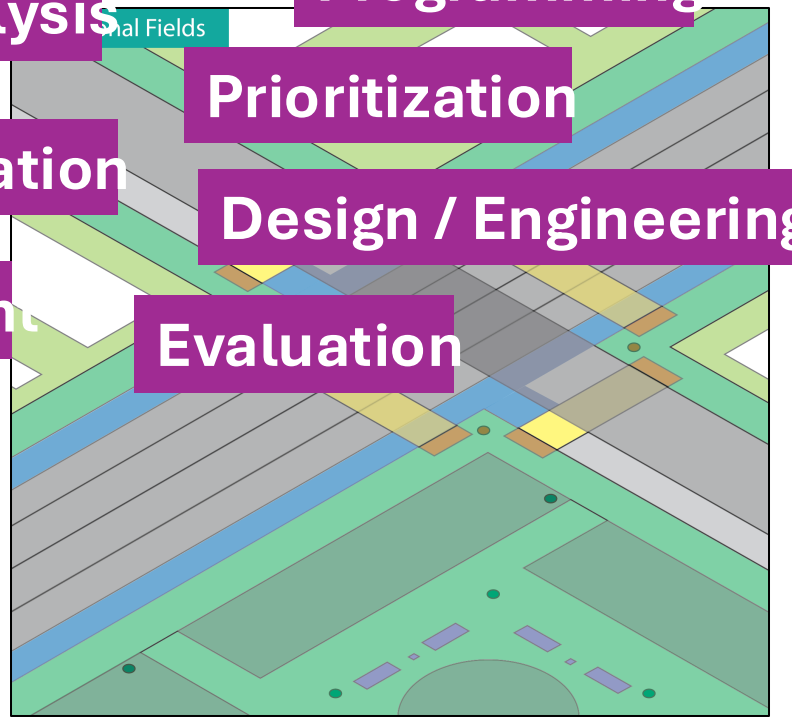
Design / Engineering

Policy Development

Evaluation







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# BPA Data Use Case

## Bicycle Level of Traffic Stress

November 7, 2024

U.S. Department of Transportation
Volpe Center

# Level of Traffic Stress (LTS)

- Road classification scheme informed by inputs:
  - Number of lanes
  - Effective vehicle speed
  - Presence/type of existing bicycle facilities
- Estimates comfort of bicyclists in the traffic stream
- Calculated and expressed at the segment level

| LTS | Comfortable Enough | Characteristics |
|---|---|---|
| 1 | Most People | Lowest Stress<br>Comfortable for most ages and abilities |
| 2 | Interested, but Concerned | Suitable for most adults<br>Presenting little traffic stress |
| 3 | Enthused and Confident | Moderate traffic stress<br>Comfortable for those already biking in American cities |
| 4 | Strong and Fearless | High traffic stress<br>Multilane, fast moving traffic |

https://www.dvrpc.org/webmaps/bike-lts/

# LTS Model: DVRPC

## Table 2: LTS in Terms of MRS (from Lowry, Furth, & Hadden-Loh)

| Roadway | | | Stress Reduction from Bicycle Accommodations | | | | |
|---|---|---|---|---|---|---|---|
| Number of Lanes | Speed Limit | Roadway Stress w/out Bicycle Accommodation | Bike Route 5% | Sharrows 10% | Bike Lane 50% | Buffered Bike Lane 65% | Protected Bike Lane 75% |
| 2 lanes (residential) | Up to 25 mph | 10% | 10% | 9% | 5% | 4% | 3% |
| 2 lanes (residential) | 30 mph | 15% | 14% | 14% | 8% | 5% | 4% |
| 2-3 lanes | Up to 25 mph | 20% | 19% | 18% | 10% | 7% | 5% |
| 4-5 lanes | Up to 25 mph | 35% | 33% | 32% | 18% | 12% | 9% |
| 2-3 lanes | 30 mph | 40% | 38% | 36% | 20% | 14% | 10% |
| 6+ lanes | Up to 25 mph | 67% | 64% | 60% | 34% | 23% | 17% |
| 4-5 lanes | 30 mph | 70% | 67% | 63% | 35% | 25% | 18% |
| 6+ lanes | 30 mph | 80% | 76% | 72% | 40% | 28% | 20% |
| 2-3 lanes | 35+ mph | 100% | 95% | 90% | 50% | 35% | 25% |
| 4-5 lanes | 35+ mph | 120% | 114% | 108% | 60% | 42% | 30% |
| 6+ lanes | 35+ mph | 140% | 133% | 126% | 70% | 49% | 35% |

**Level of Traffic Stress Limits**

| LTS 1 Limit: | 10% | LTS 2 Limit: | 30% | LTS 3 Limit: | 60% | LTS 4 Limit: | no MRS limit |
|---|---|---|---|---|---|---|---|

https://www.dvrpc.org/webmaps/bike-lts/pdf/bikestressdocumentation_phase3_11-10-21.pdf

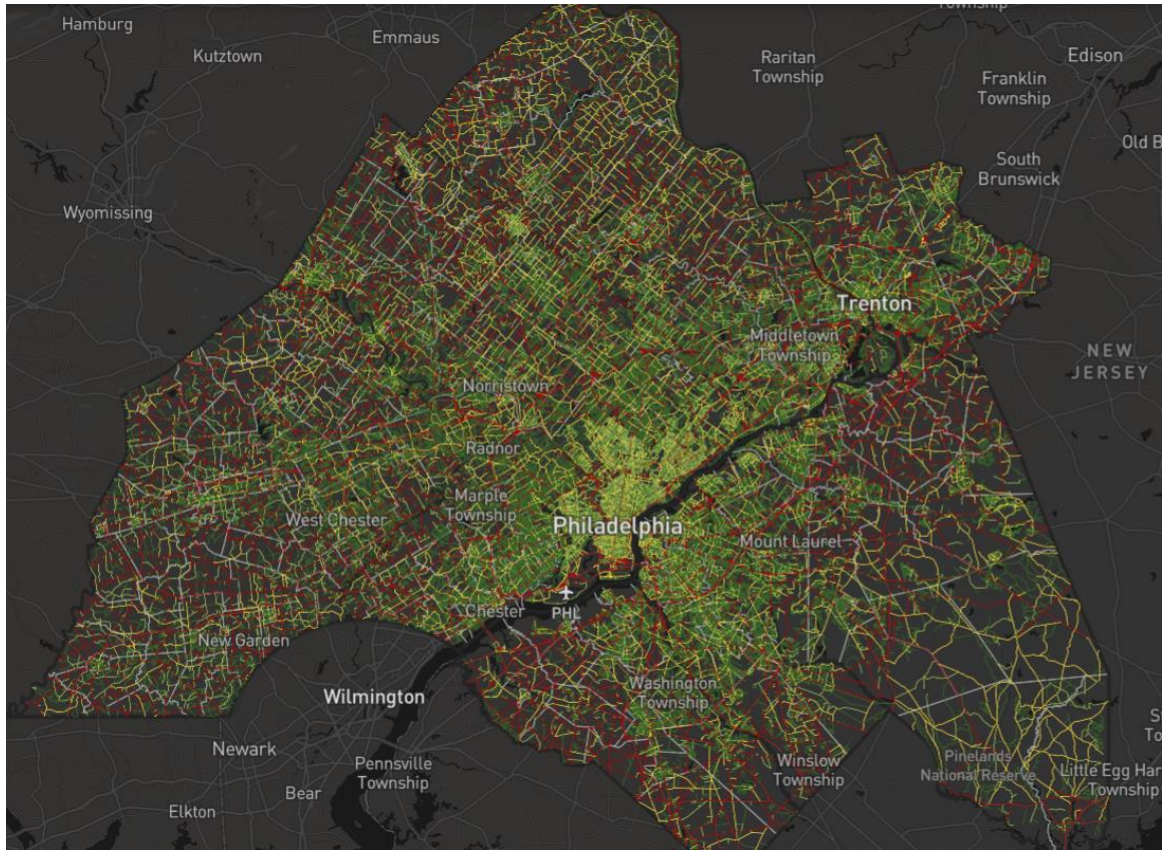
# Applying LTS

- Improving network connectivity
  - Reduce LTS in key LTS 3&4 segments
  - Bridge gaps between LTS 1&2 "islands"


- MPO-level Initiatives
  - DVRPC/PennDOT Connects Complete Streets Resurfacing Program
  - DVRPC Expo: Experimental Pop-ups Program


https://www.dvrpc.org/webmaps/bike-lts/

# Evaluating LTS




https://www.dvrpc.org/webmaps/bike-lts/analysis/

- Lacking detailed infrastructure data, input parameters are relatively barebones
- Ease of application over a wide region > detailed metric development
- Calculation at the segment level leaves discontinuities
- No differentiation for intersections or crossings

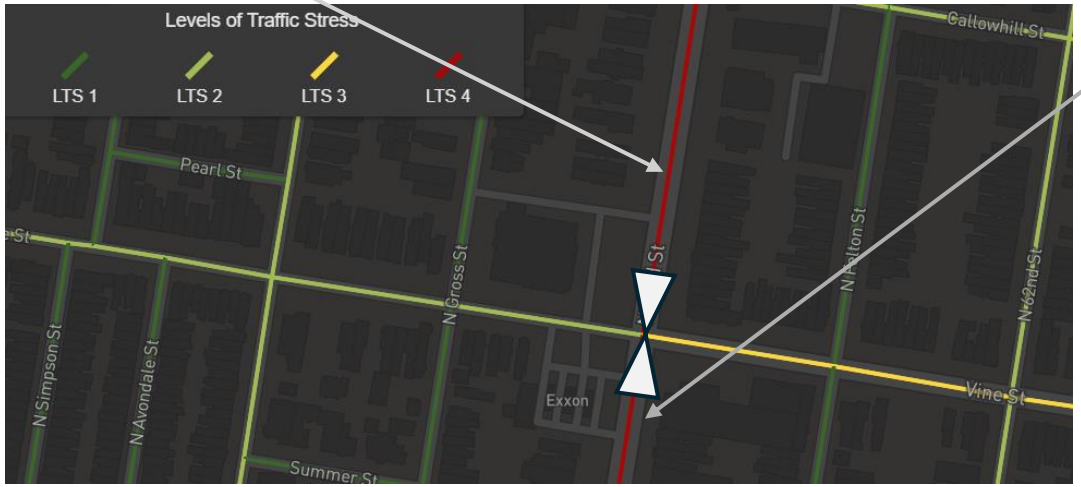
# Case Study: Vine St. & 63rd St., Philadelphia


Image source: Google Maps

https://www.dvrpc.org/webmaps/bike-lts/analysis/

# Evaluating LTS



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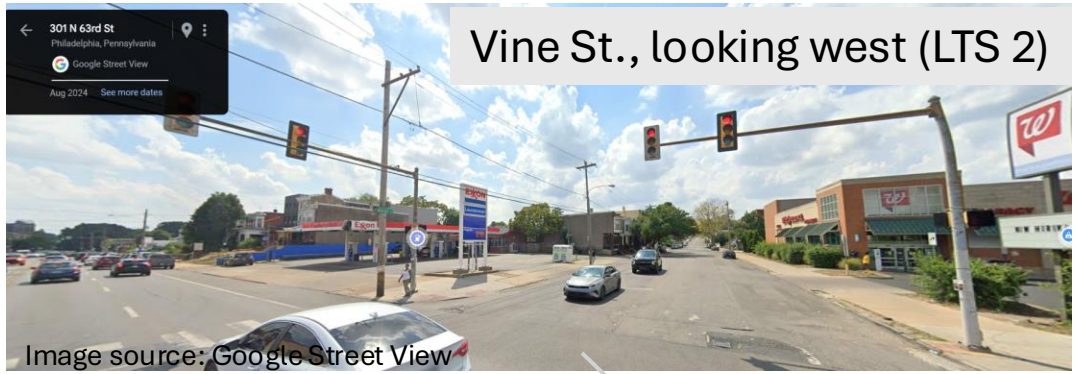


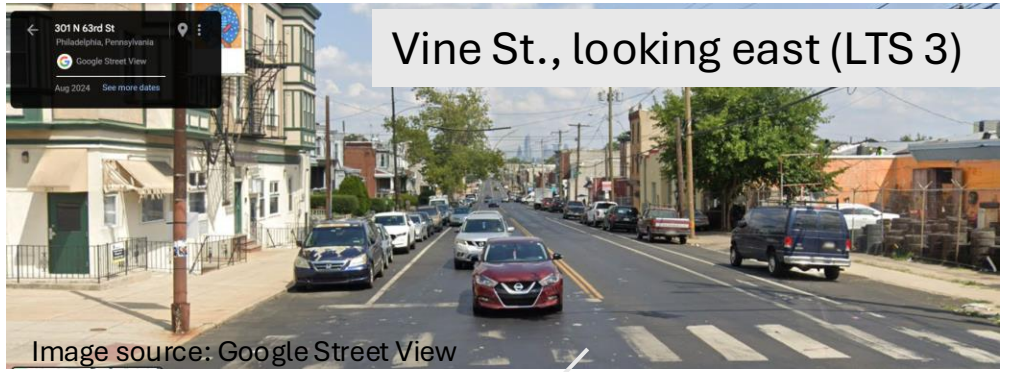



https://www.dvrpc.org/webmaps/bike-lts/analysis/

# BPA Glossary

Defining the terms that define BPA transportation infrastructure

November 7, 2024

U.S. Department of Transportation
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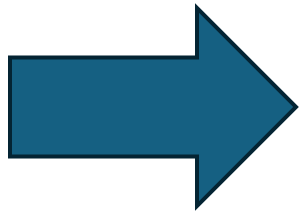
# Objectives



Spatial Data Terms.xlsx

- Identify key classes of terms, and terms, for BPA infrastructure
  - Source existing definitions from authoritative references
    - MUTCD
    - Open Street Map
    - PROWAG
    - OpenSidewalks
    - CurbLR
  - Select “best” definitions or craft hybrid definitions
- Identify official definitions for other general/mapping terms

# Classes

- Bicycle Facilities
- Footpaths
- Multi-use Facilities

- Roads

- Signage
- Signals

# Terms – Rough Starter Lists

## Bicycle Facilities

- Bicycle
- Bicycle Box
- Bicycle Facilities
- Bicycle Lane
- Buffer-Separated Bicycle Lane
- Counter-Flow Bicycle Lane
- Separated Bicycle Lane
- Bikeway
- Designated Bicycle Route
- Two-Stage Bicycle Turn Box
- Bicycle signal face

## Footpaths

- Pedestrian
- Pedestrian Facility
- Sidewalk
- Sidewalk Extension
- Sidewalk Grade Crossing
- Curb
- Raised Curb
- Rolled Curb
- Curb Ramp
- Flush Curb
- Footway (plain)
- Crossing
- Traffic Island
- Pedestrian Road
- Pedestrian zone
- Pathway grade crossing
- Crosswalk
- Curb line
- Pedestrian Access Route
- Pedestrian Circulation Path
- Pedestrian Facility
- Perpendicular curb ramp
- Tactile Warning Strip
- Ramp
- Steps

## Multi-use Facilities

- Shared-Use Path
- Shared-Use Crossing
- Pathway
- Shared Roadway
- Living street

## Roads

- Site Roadways Open to Public Travel
- Traveled Way
- Junction
- Arterial Highway (Street)
- Barrier-Separated Lane
- Conventional Road
- Crosswalk
- Driveway
- Intersection
- Roadway Network
- Motor Vehicle Roads
- Primary Street
- Secondary Street
- Tertiary Street
- Residential street
- Service Road
- Driveway
- Alley
- Parking aisle
- Alley
- Urban street
- Highway
- Roadway
- Power pole
- Fire hydrant
- Bench
- Bollard
- Manhole
- Street lamp
- Waste basket

## Signals

- Accessible Pedestrian Signal
- Accessible Pedestrian Signal Detector
- Pedestrian Change Interval
- Pedestrian Clearance Time
- Vicbrotactile Pedestrian Device
- Visibility-Limited Signal Face or Visibility-Limited Signal Section
- Wayside Horn System
- Detectable Warning Surface
- Pedestrian Activated Warning Devices
- Push Button Locator Tone
- Audible and Vibrotactile Walk Indications
- Percussive Tone
- Speech Walk Message
- Speech Information Message when Walk Interval is Not Timing
- Speech Walk Message during Pedestrian Phasing Concurrent with Vehicular Phasing
- Vibrotactile Walk Indication
- Active Grade Crossing

# Example of a Tricky Classification Situation

1. “Audible and Vibrotactile Walk Indications”
   - This is an accessible pedestrian signal (2-3 classes)
   - Should this be classified under footpath or signals (or accessibility, if we use that as a classification)?

2. Would curb-related terms fall under “footpath” or “roadway”?

3. How do we classify objects like benches, street trees, utility covers…?

# Got opinions?

- Sign-up to work on the glossary sub-sub-committee!