

# Pedestrian Services at Signalized Intersections

Presentation to City Transportation Commission

2024.03.20

# Topics in This Presentation

- Marked crosswalk
- Diagram showing conflicting movements
- Safety performance
- Existing practice
- Considerations and future work

# Marked Crosswalk

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Uncontrolled  
crossing



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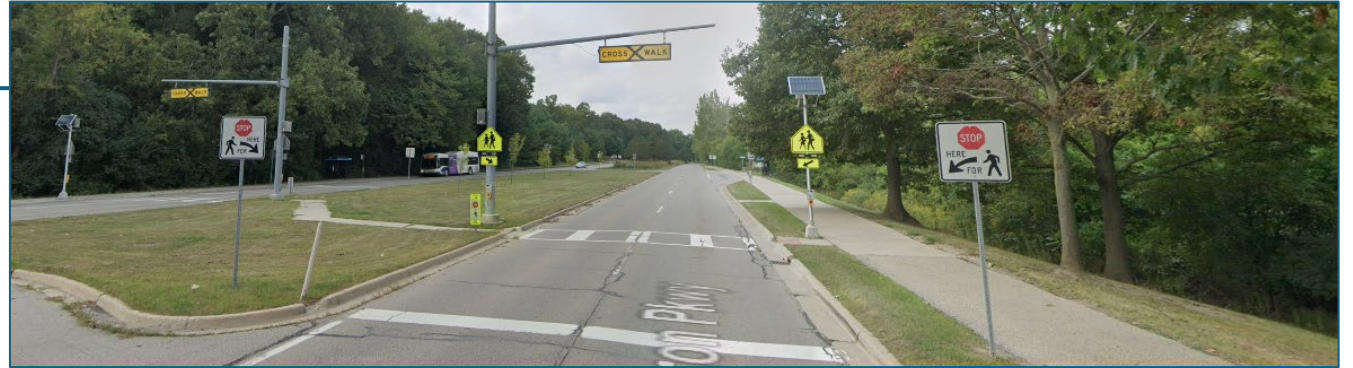
STOP-  
controlled  
intersection



# Marked Crosswalk

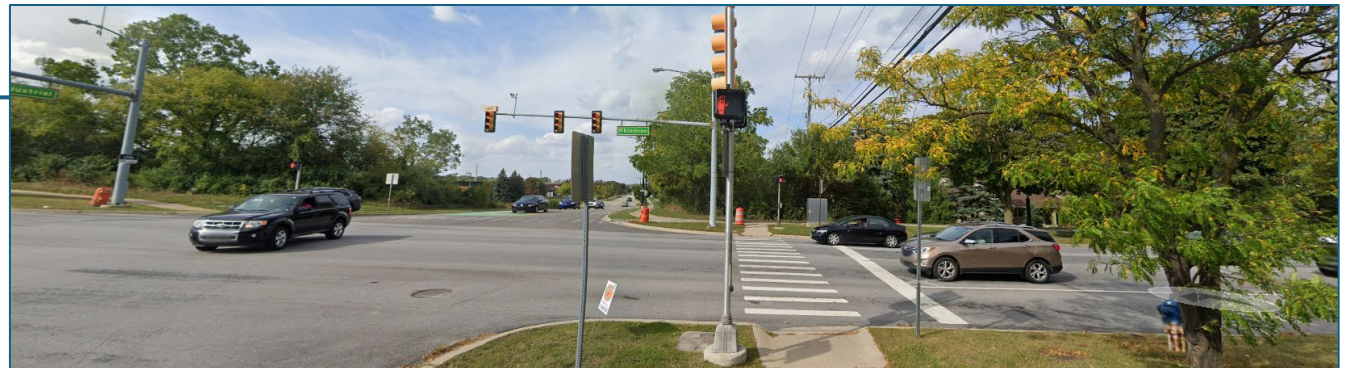
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RRFB (rectangular  
rapid flashing  
beacon)



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At signalized  
intersection





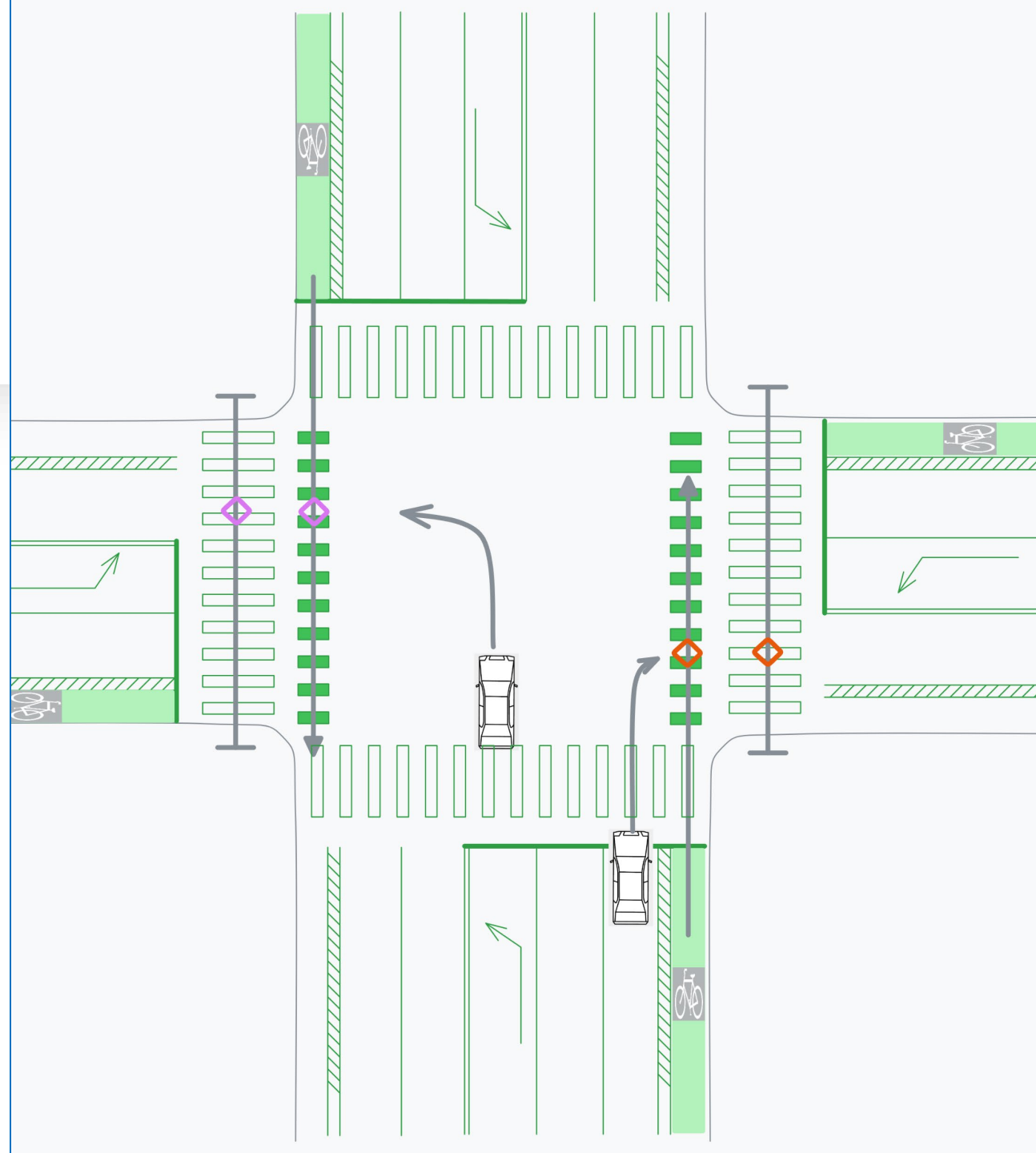
## RRFB and Left Turn

Eisenhower & Northbrook

- Left turn movements from median approach

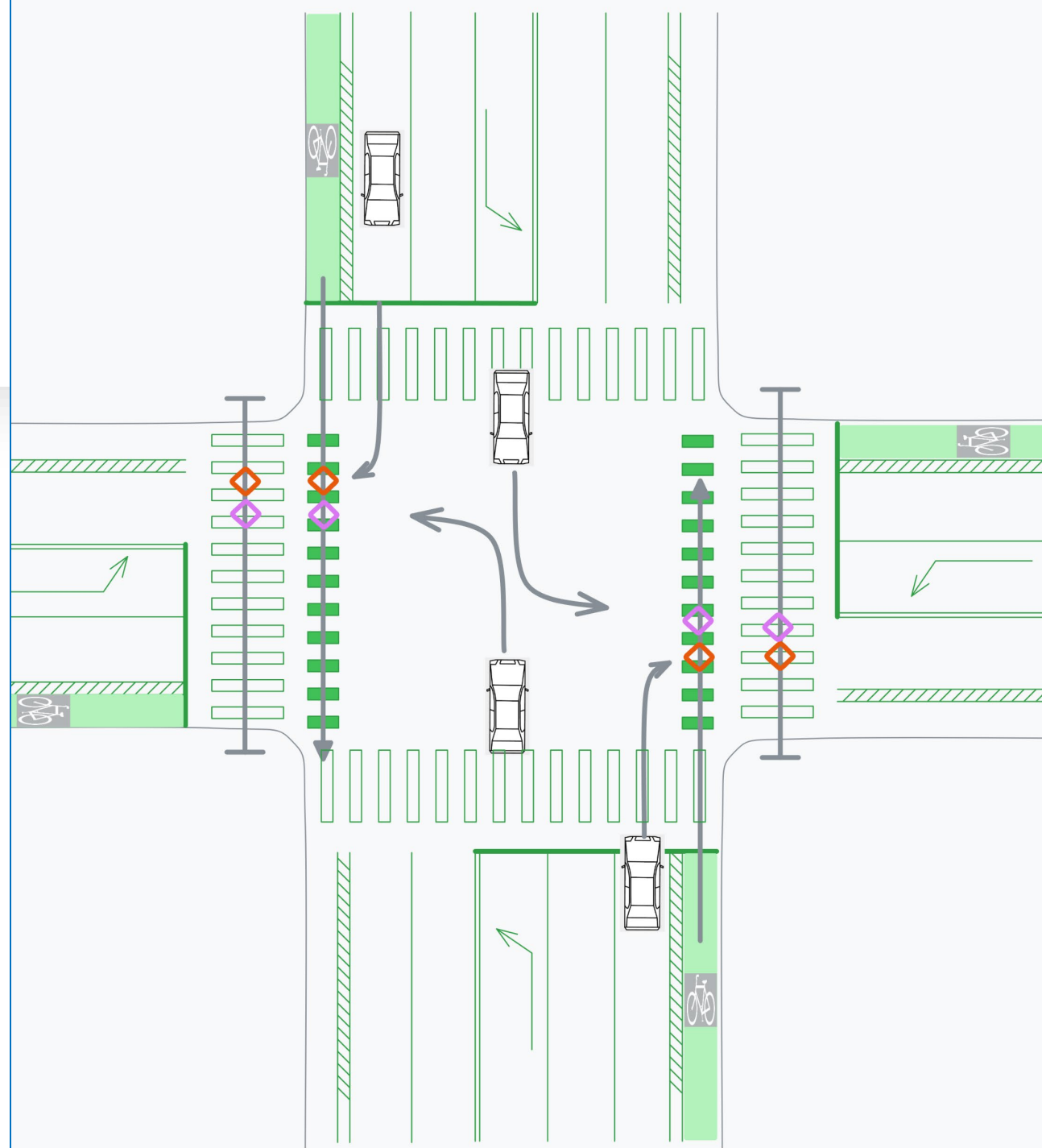
# Conflicting Movements

- From the perspective of motorized
  - Left-turning vehicle
  - Right-turning vehicle



# Conflicting Movements

- From the perspective of non-motorized
  - Left-turning vehicle
  - Right-turning vehicle



# Safety Performance

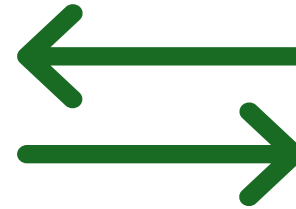
- From 2014.01.01 to 2024.02.29
  - Fatal and A-level 'pedestrian involved' crashes
    - Fatal = 12
    - A-level = 82
  - Fatal and A-level injury crashes involving motor vehicle turning at signalized intersections
    - Fatal = 1
      - Permissive only = 1
    - A-level = 16
      - Permissive only = 14
      - Perm + Prot FYA = 2



# Safety Performance

- From 2014.01.01 to 2024.02.29
  - Fatal and A-level 'Bicycle involved' crashes
    - Fatal = 5
    - A-level = 36
  - Fatal and A-level injury crashes involving motor vehicle turning at signalized intersections
    - Fatal = 0
    - A-level = 5
      - Permissive only = 3
      - Perm + Prot FYA = 2

# Existing Practice in the City



## Pedestrian traffic signal equipment

No pedestrian signal – locations without marked crosswalk

With pedestrian signal – marked crosswalk

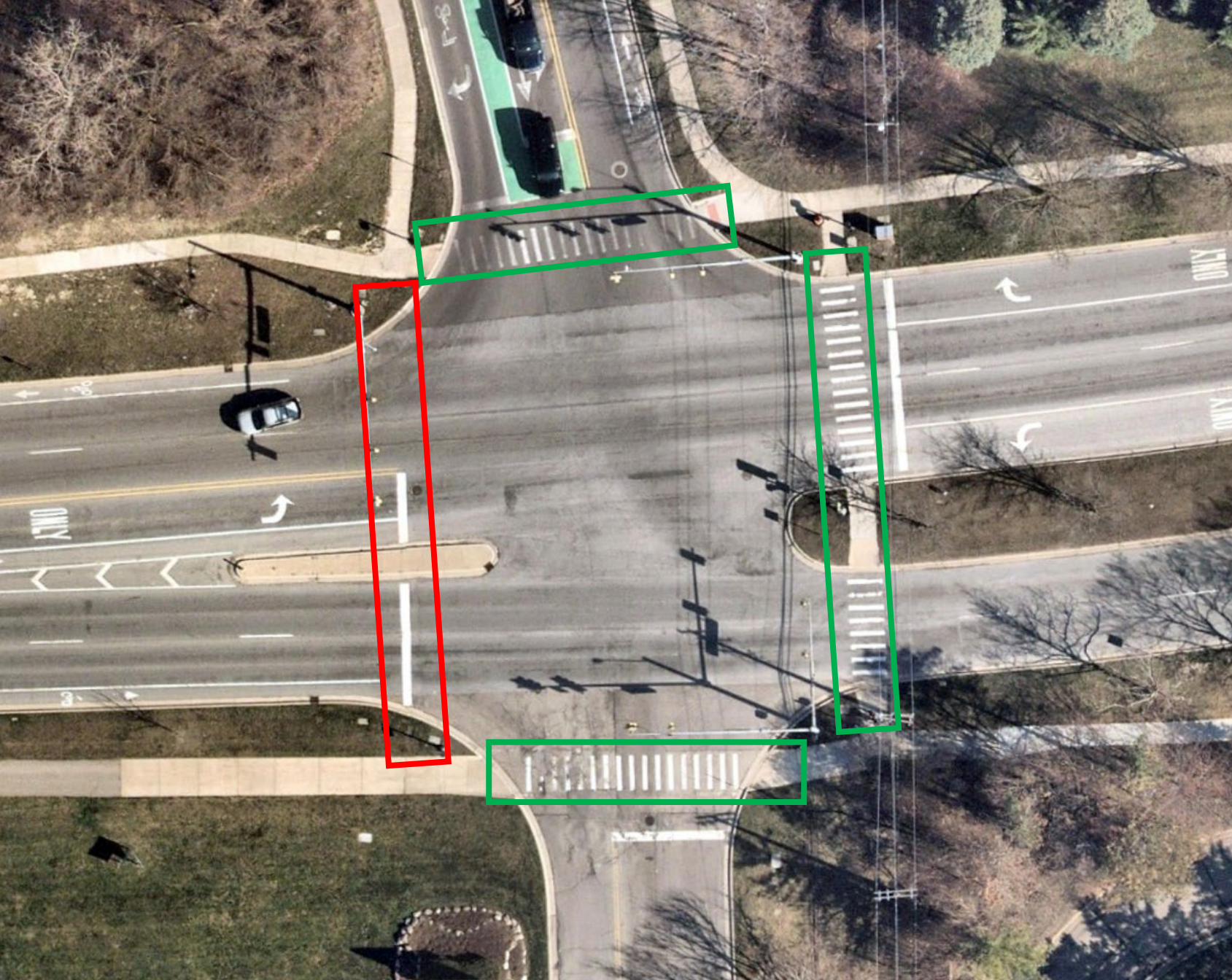
- No push buttons – must automatically service
- With push buttons
  - APS (accessible pedestrian signal)
  - Non-APS

## Pedestrian traffic signal operations

Automatic service vs. requiring user activation

LPI (leading pedestrian interval)

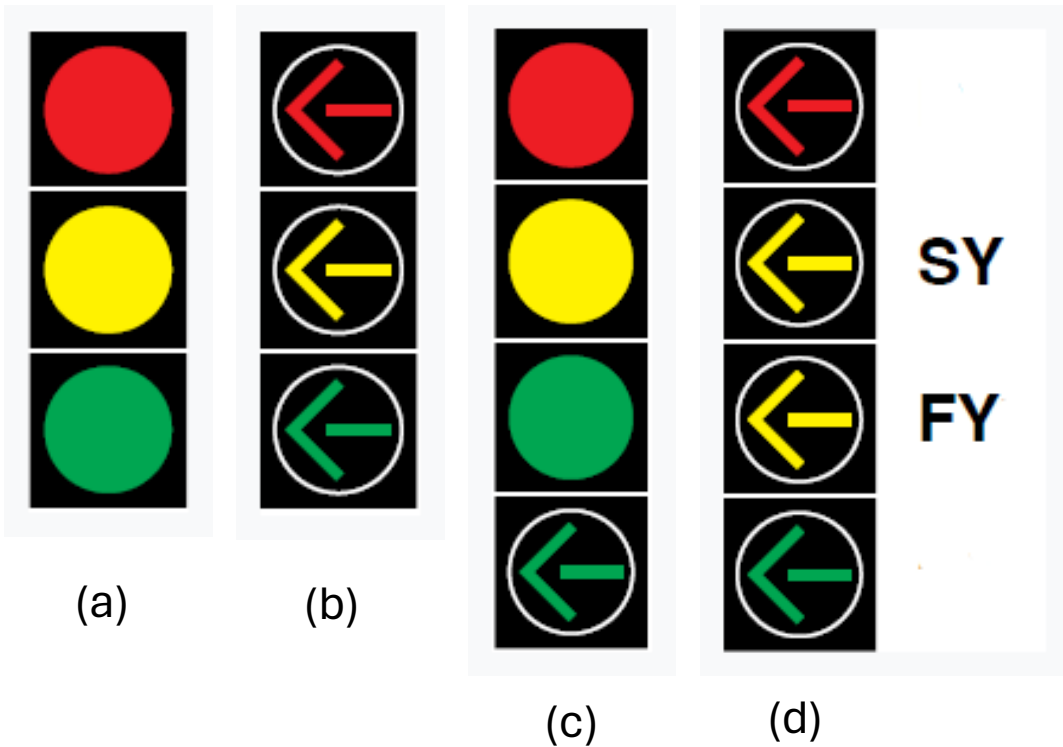
Exclusive pedestrian phase (aka. pedestrian scramble)



## Field Example

- No marked crosswalk for crossing the west leg
- Marked crosswalk and push buttons for crossing other legs

# Traffic signal for left-turn movement



## Equipment

- (a). No dedicated signal
- (b). 3-section left
- (c). 4-th level arrow
- (d). FYA (flash yellow arrow)

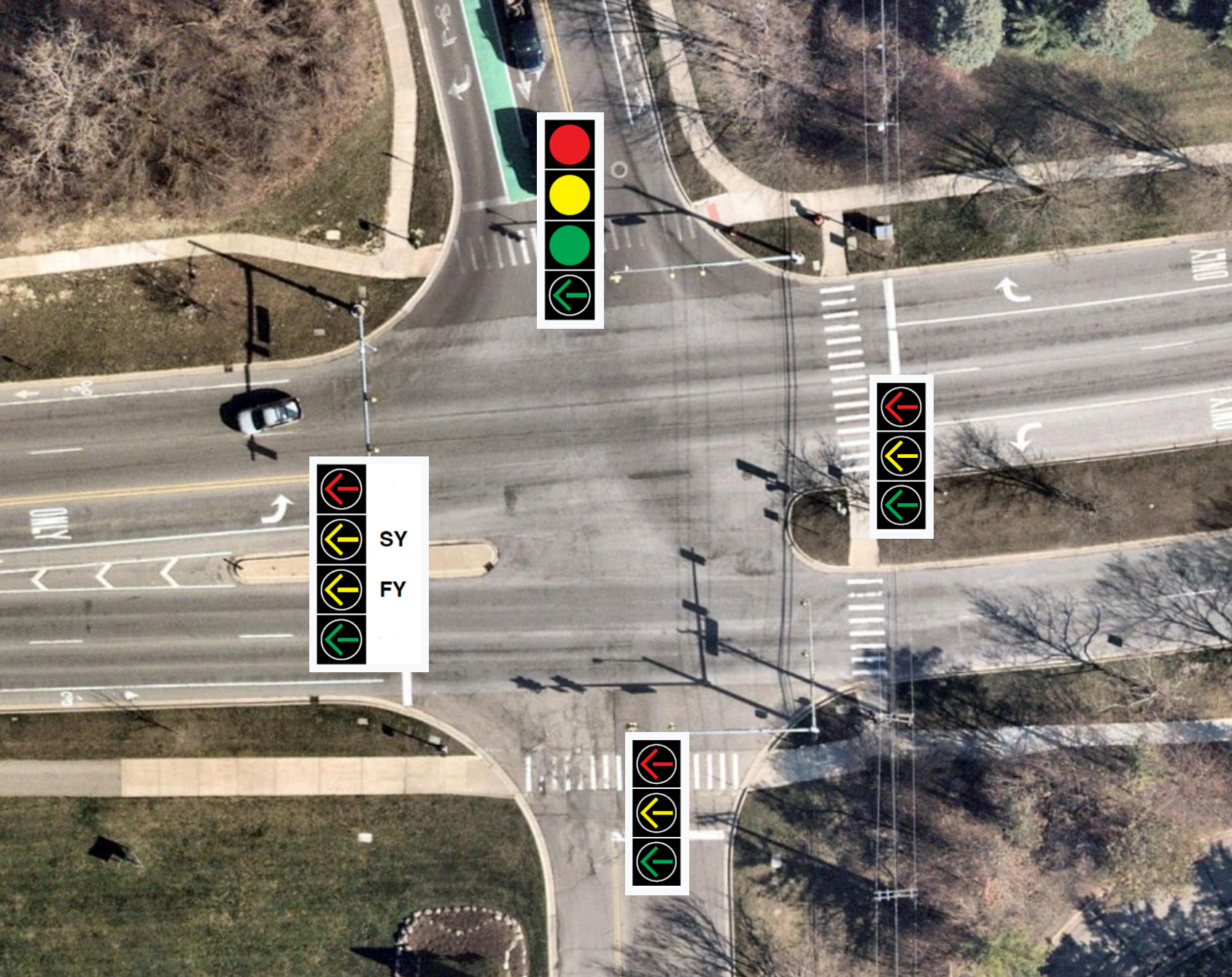
## Operations

### Types

- Permissive (a)
- Protected (b)
- Perm+Prot (c, d)

Omit permissive when servicing pedestrian

- Protected only (permanently omit permissive)
- Using FYA assembly (dynamically omit permissive)



# Field Example

Eisenhower & Industrial has a combination of three types of left-turn treatment

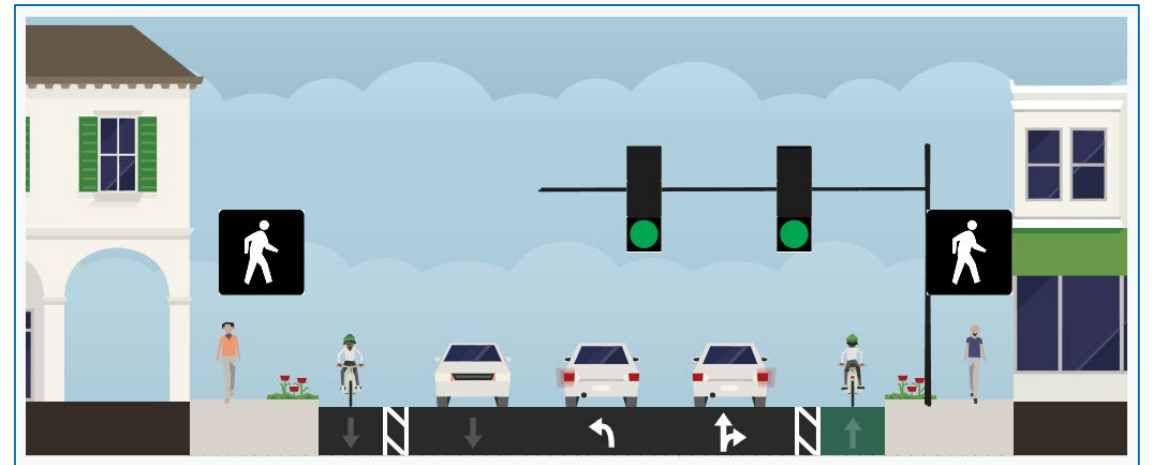
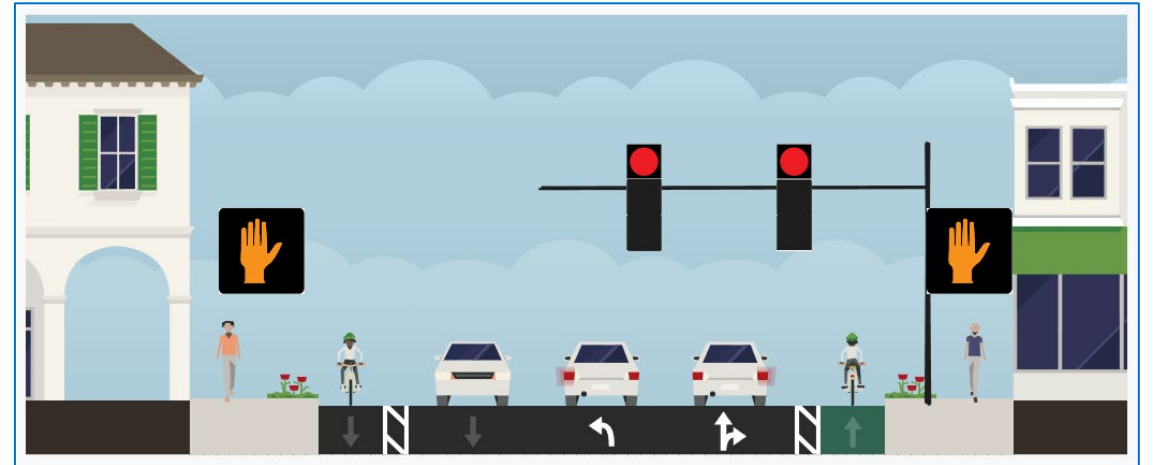
- Eastbound left: FYA
- Westbound left: 3-section
- Northbound left: 3-section
- Southbound left: 4-th level green arrow

Most signalized intersections do not have this many combinations.

# No dedicated left-turn signal

Left-turn movement is permanently in permissive mode, requiring drivers to yield to pedestrians

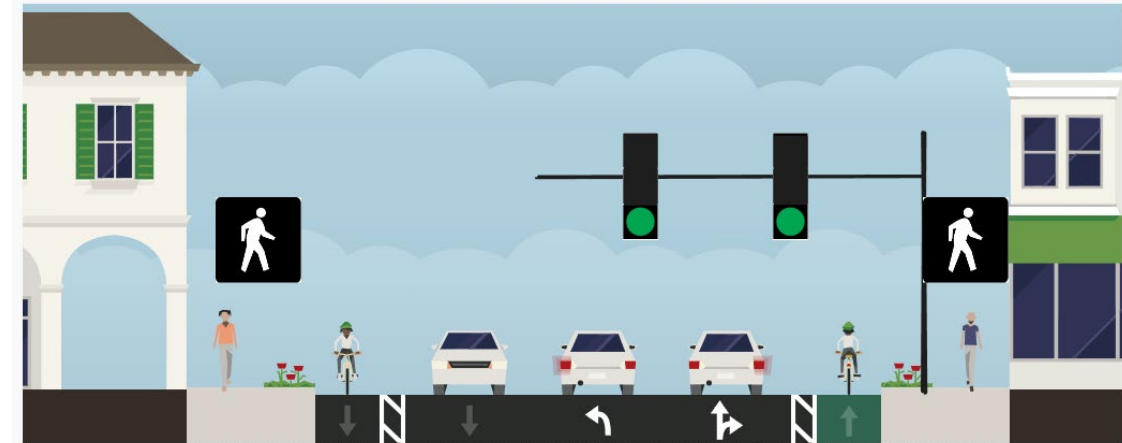
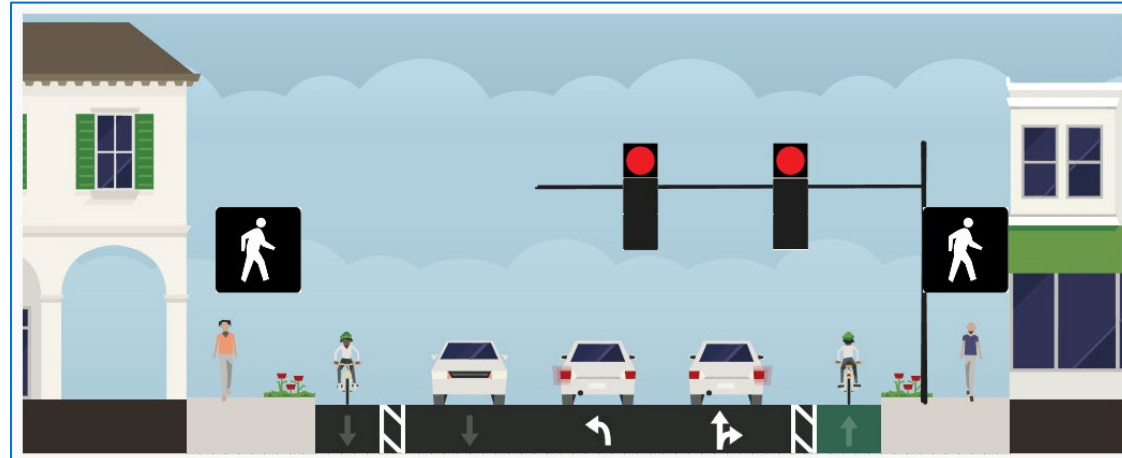
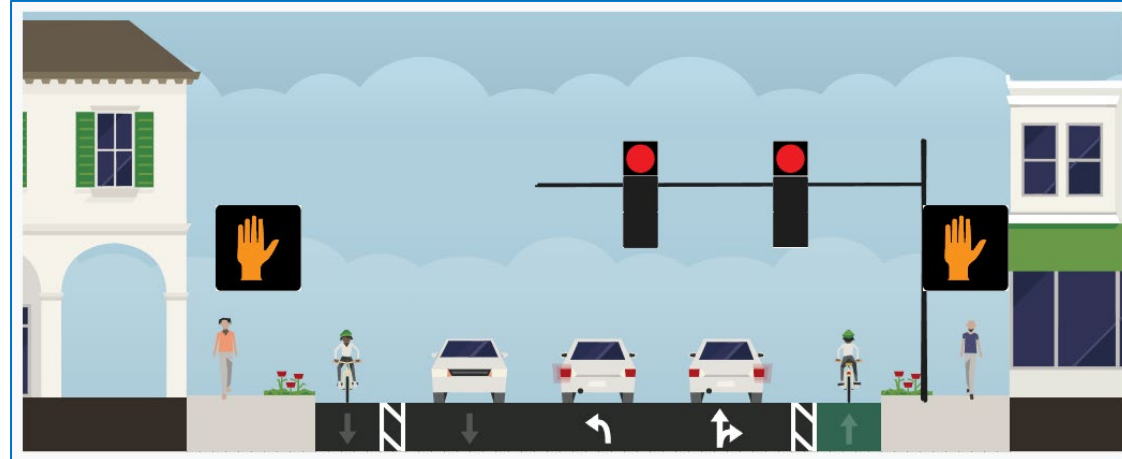
- Many signalized intersections in downtown
- Certain intersections along commuting corridors



# LPI (leading pedestrian interval)

Start pedestrian Walk interval several seconds prior to the start of vehicular green.

Implemented at all City intersections and select MDOT intersections.





# Field Example

Fernwood & Packard

- All directions: no dedicated left-turn signal



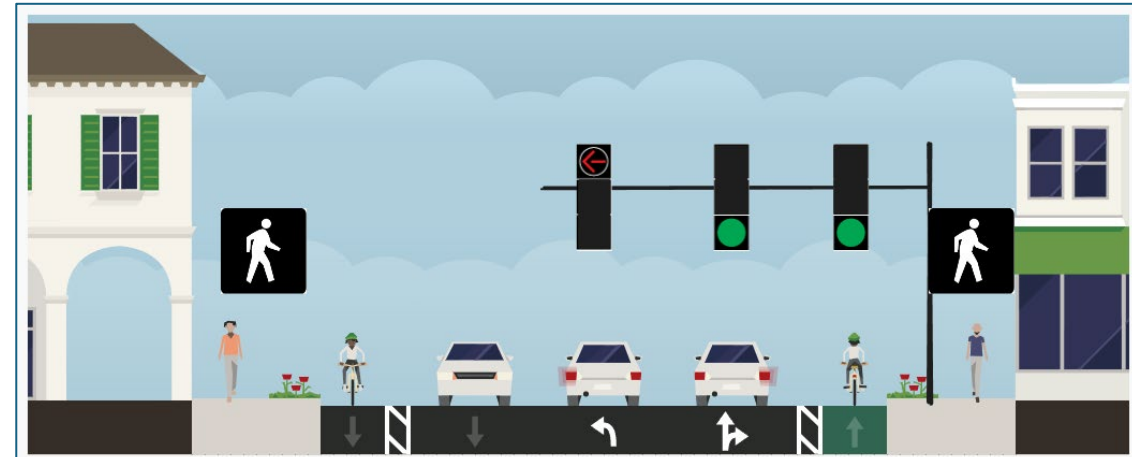
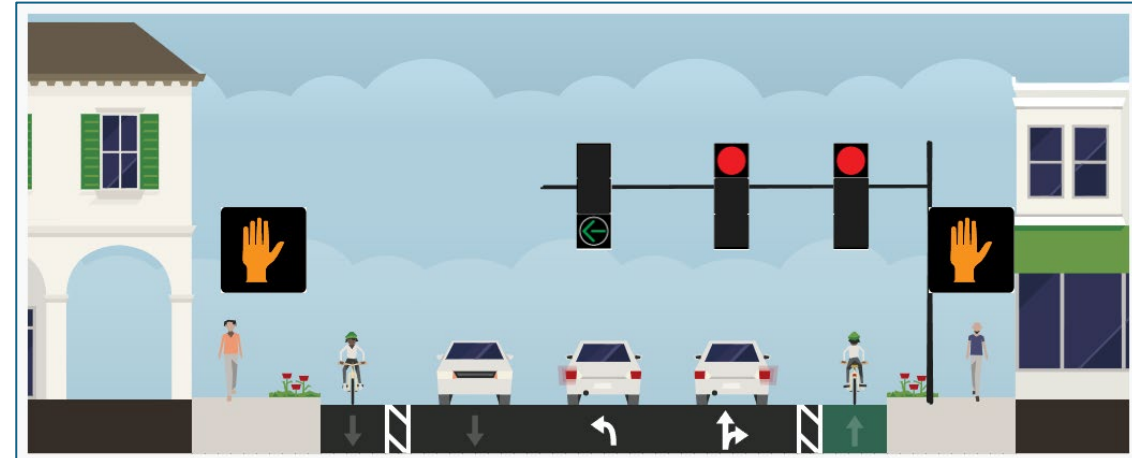
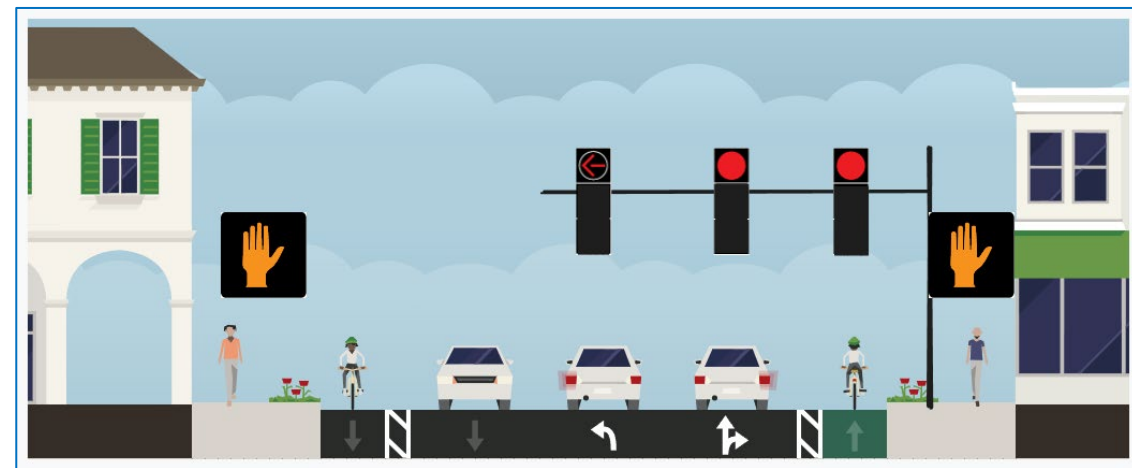


# Left-turn signal with 3-section assembly

Left-turn movement is serviced by protected-only mode.

There is no permissive period for left-turning movement.

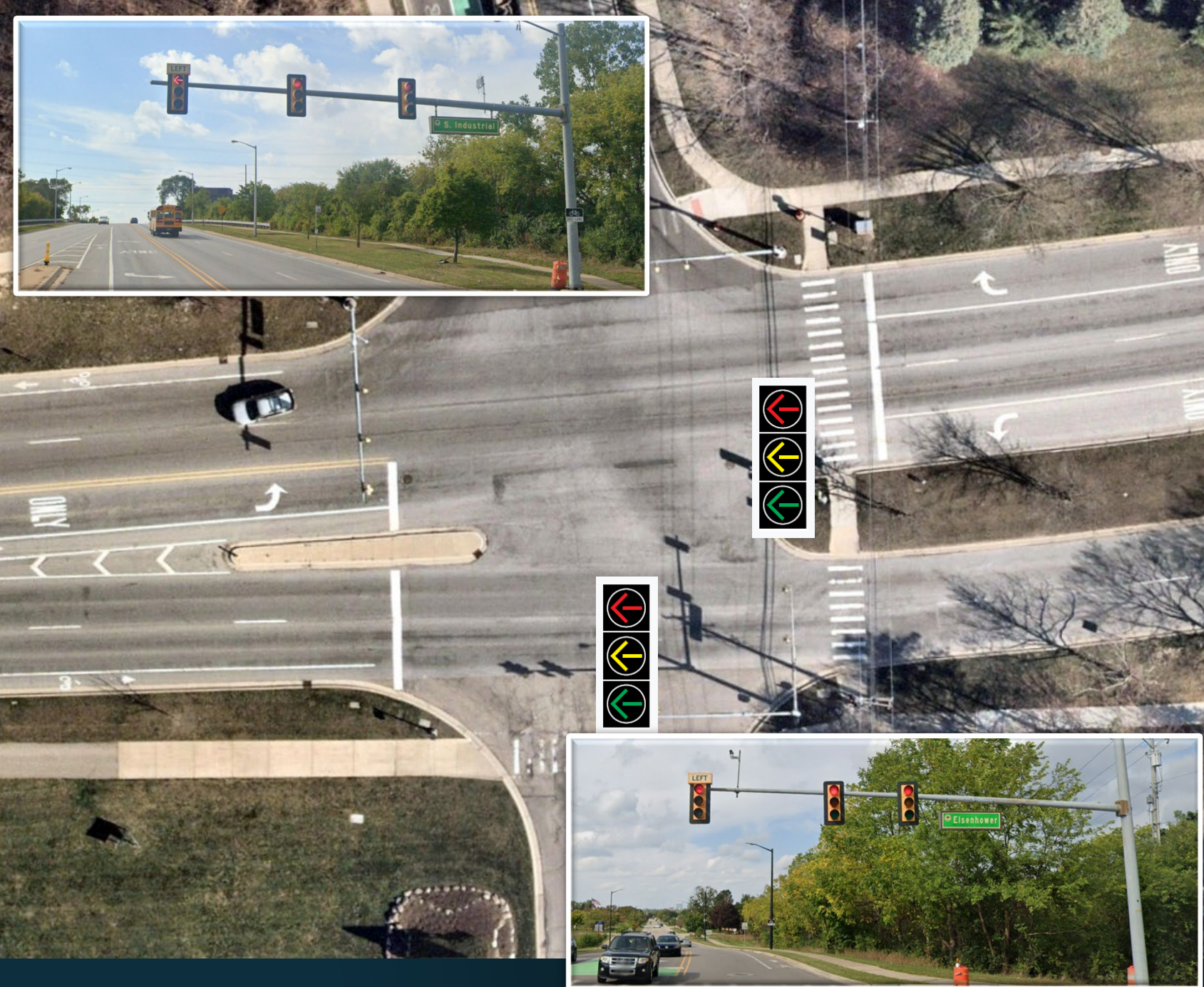
Drivers need to follow signal indication.



# Field Example

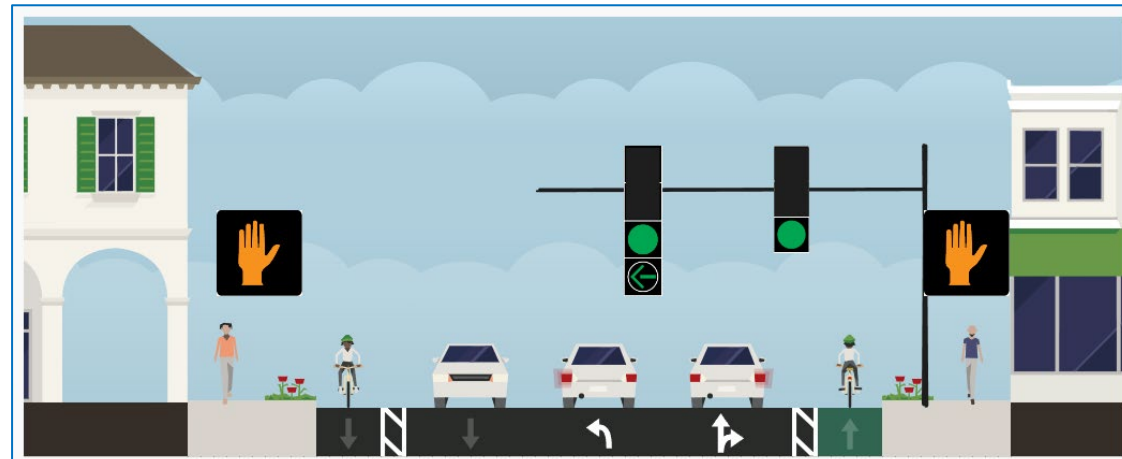
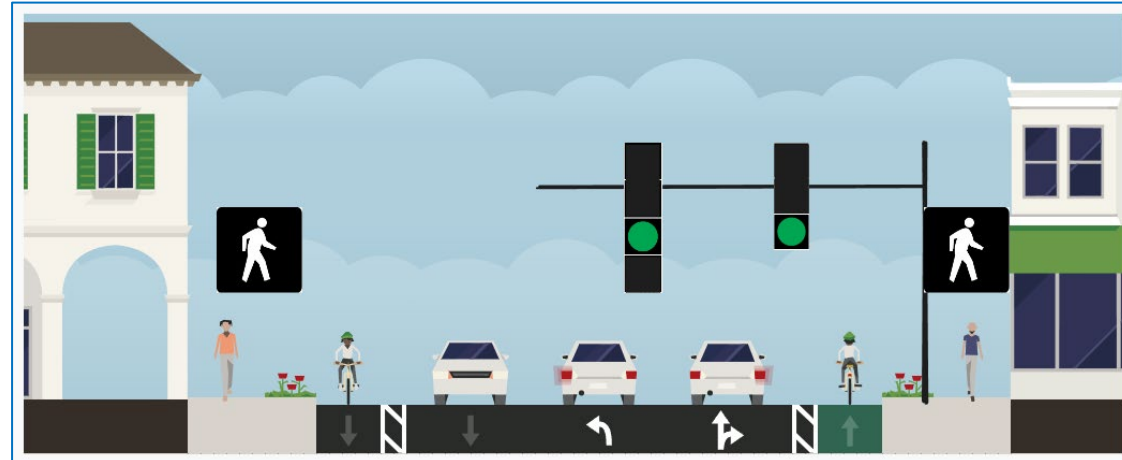
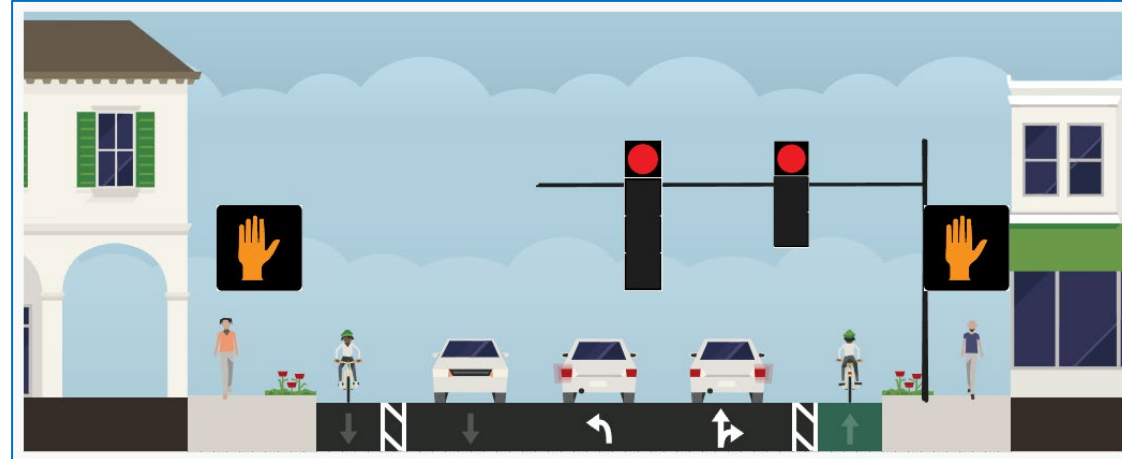
Eisenhower & Industrial

- Westbound left: 3-section
- Northbound left: 3-section



# Left-turn signal with 4<sup>th</sup>-level green arrow

Left-turn movement is serviced by either  
'protected-only mode' or 'perm+prot mode'.  
Drivers needs to follow signal indication, and  
yield to pedestrians.  
Cannot omit permissive left-turn movement.





# Field Example

## Eisenhower & Industrial

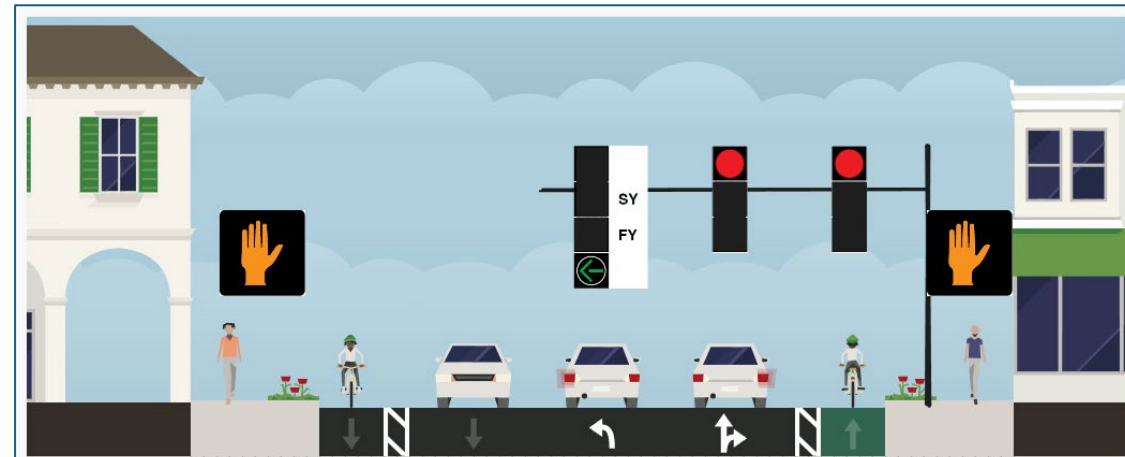
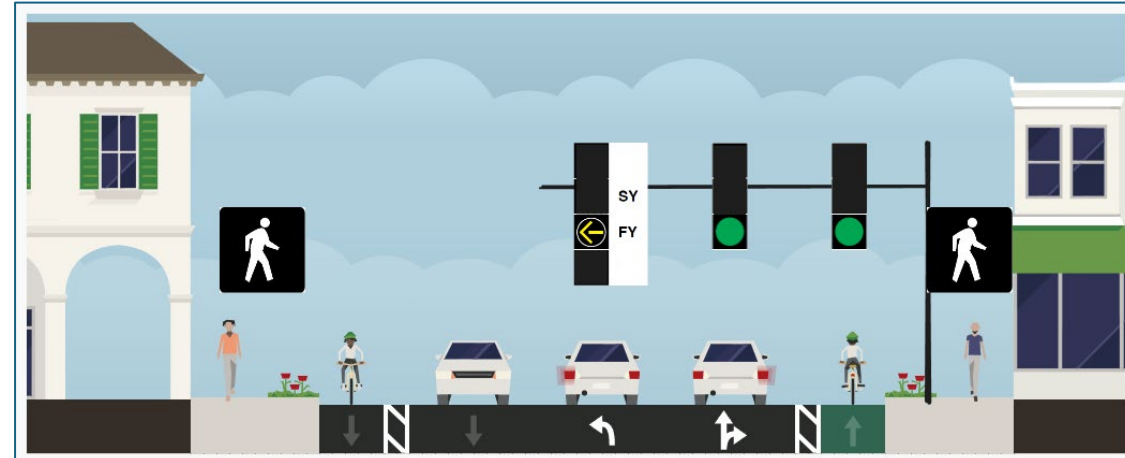
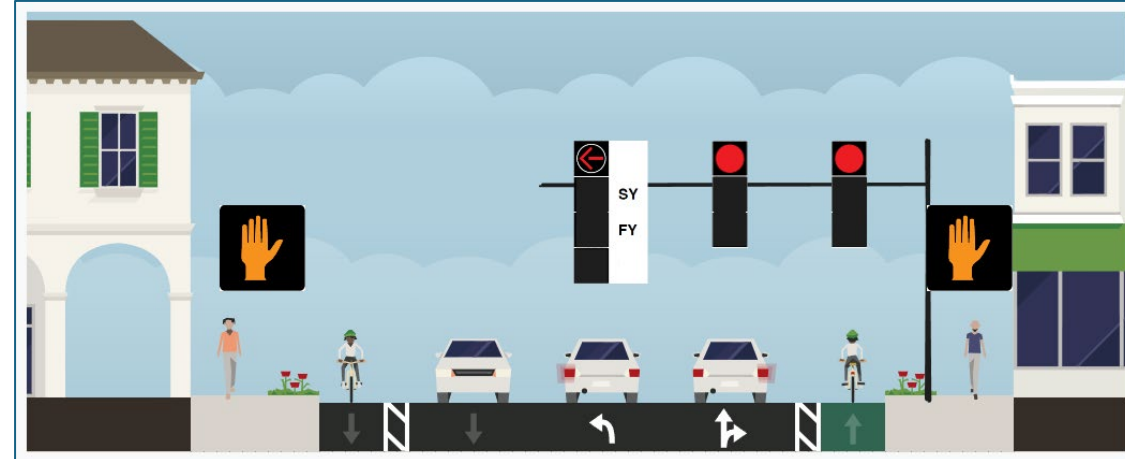
- Southbound left: 4th level green arrow in 'protected-only' mode



# Left-turn signal with FYA (flash yellow arrow) assembly

Left-turn movement is serviced by 'perm+prot' mode. Drivers need to yield to pedestrians during permissive period.

Capable of dynamically omitting permissive period when pedestrians request service.



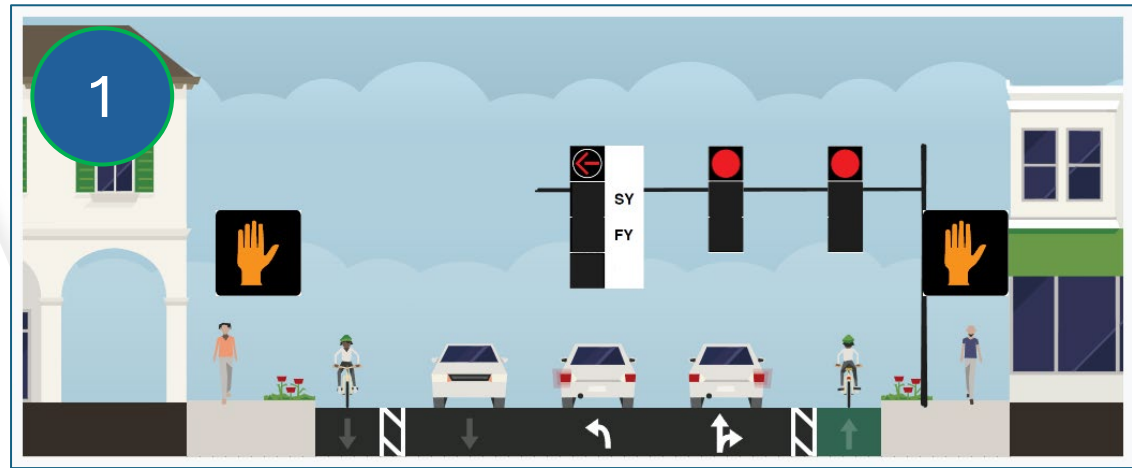


# Field Example

Eisenhower & Industrial

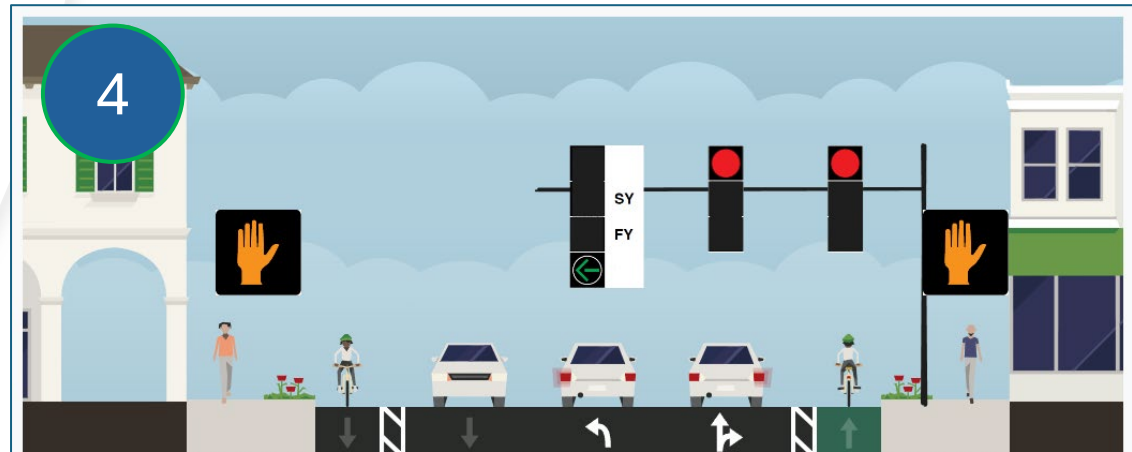
- Eastbound left: FYA

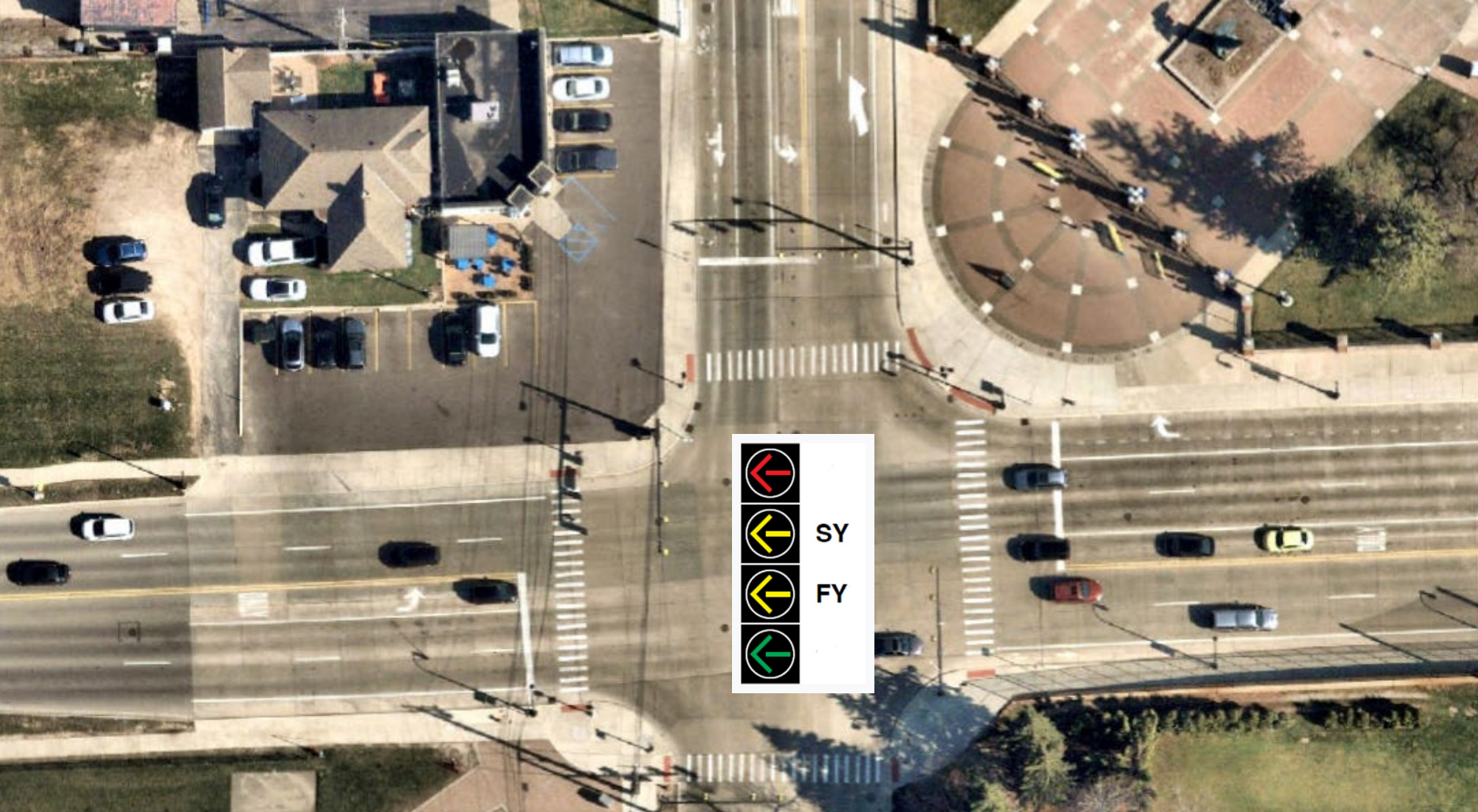
# FYA omit Permissive mode during pedestrian service



## Consideration:

If pedestrians are automatically serviced, Permissive period is de facto disabled permanently.

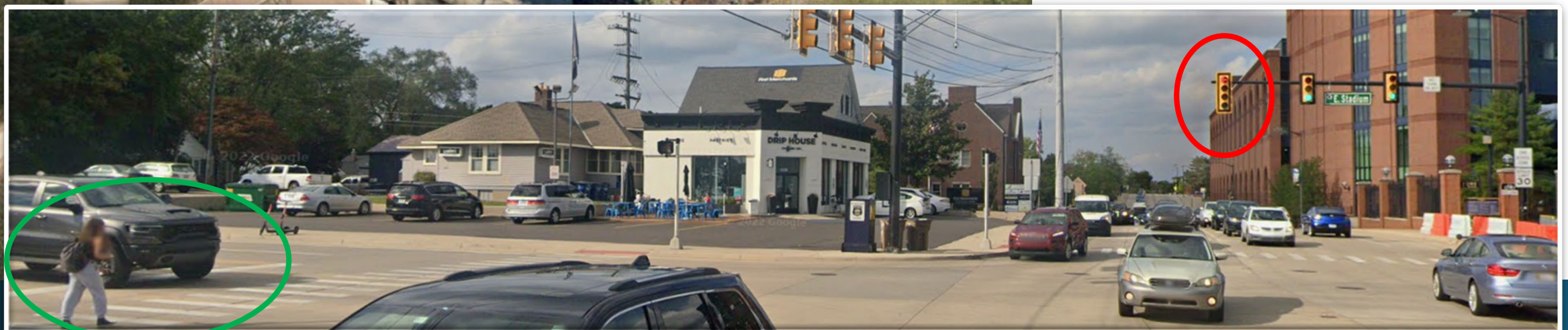




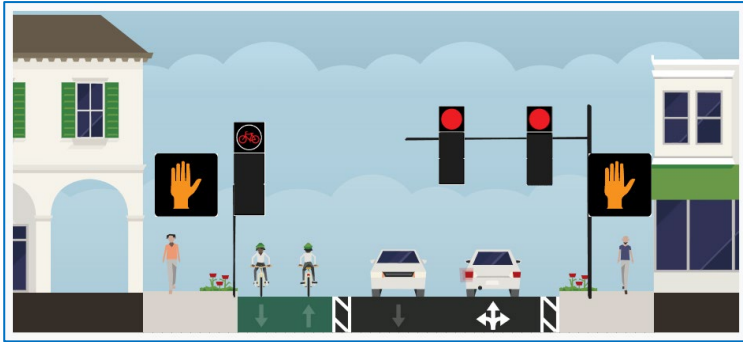
# Field Example

## Main & Stadium

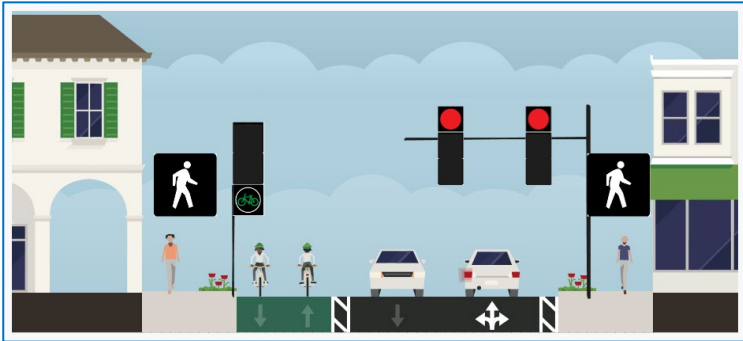
- All directions left: FYA and omit permissive period during pedestrian service





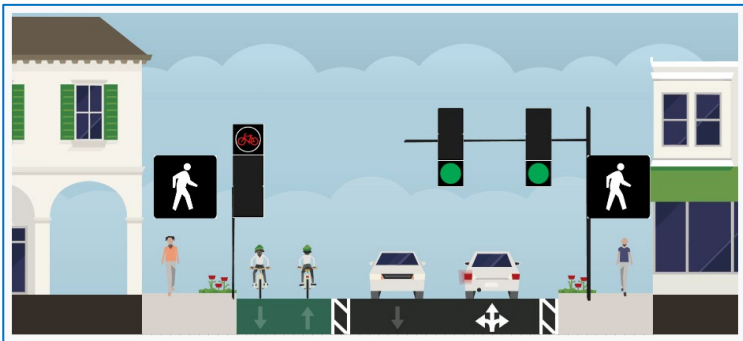


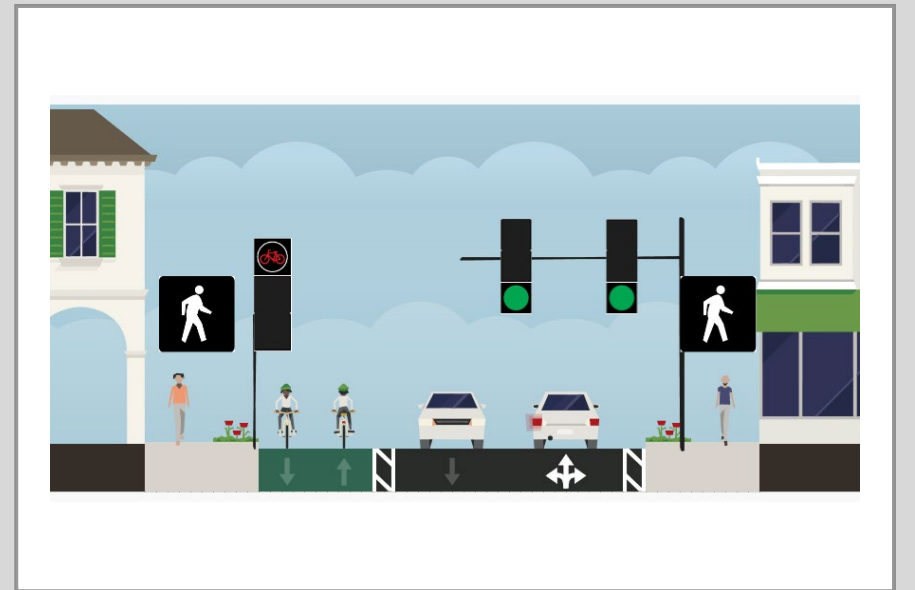
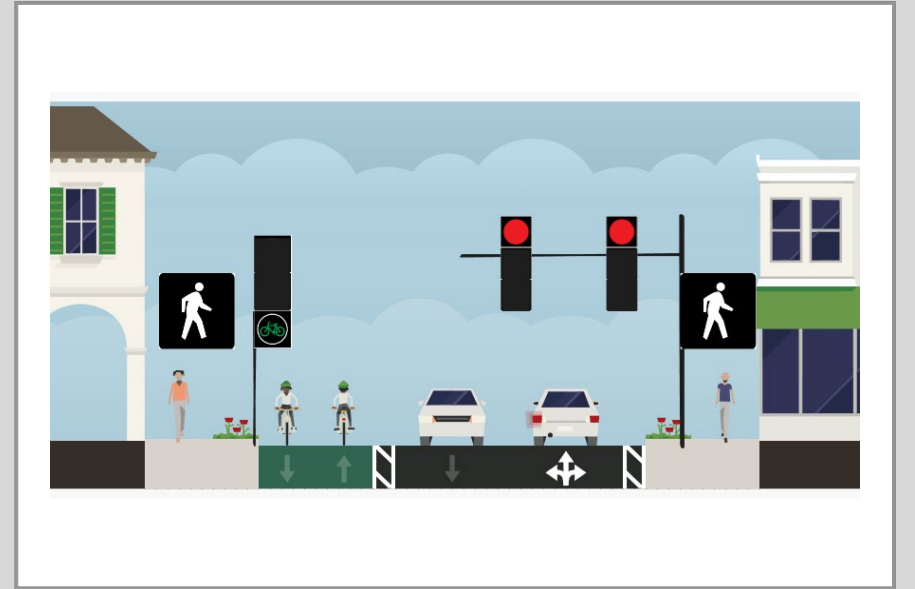
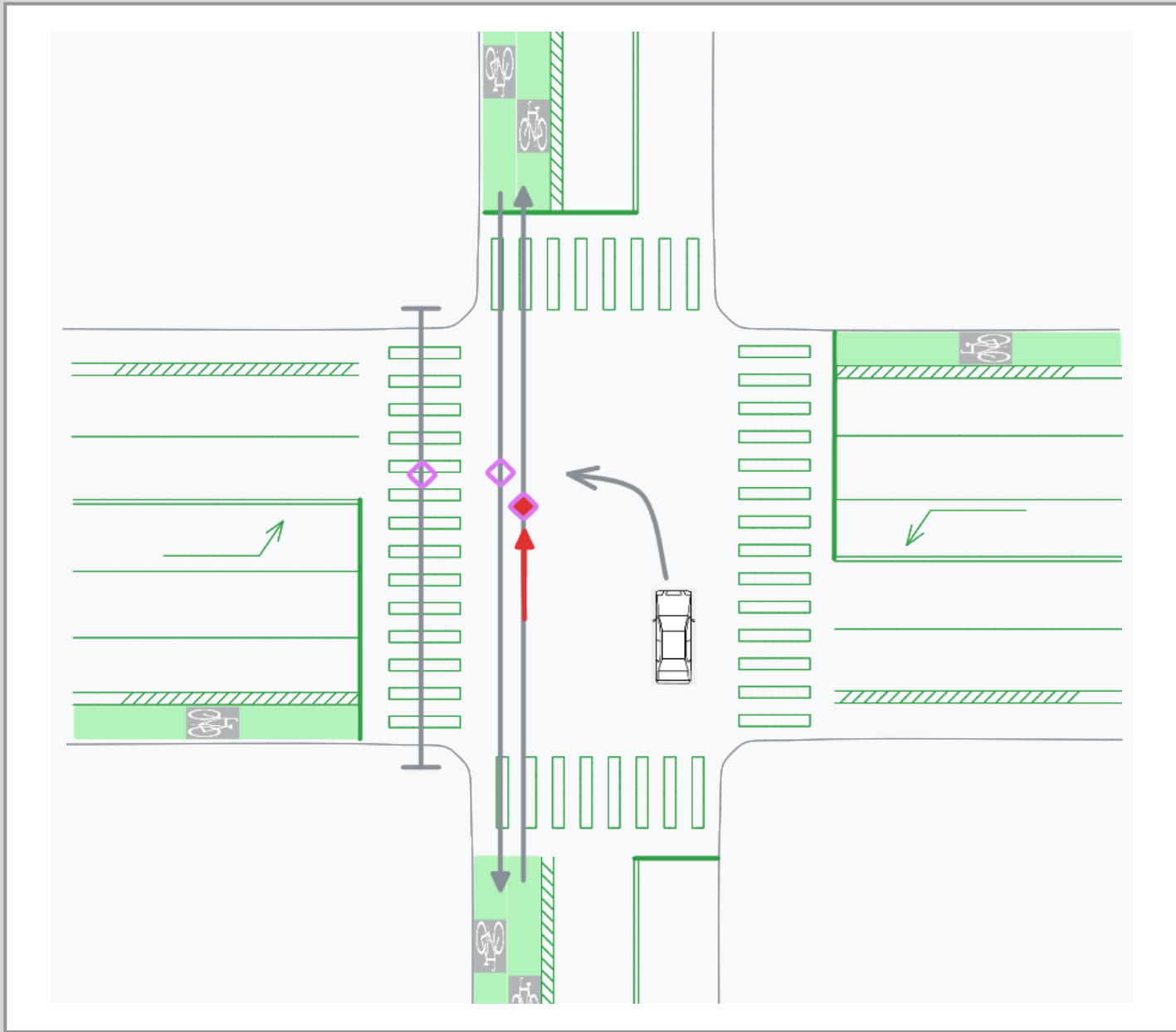
# Bicycle signal

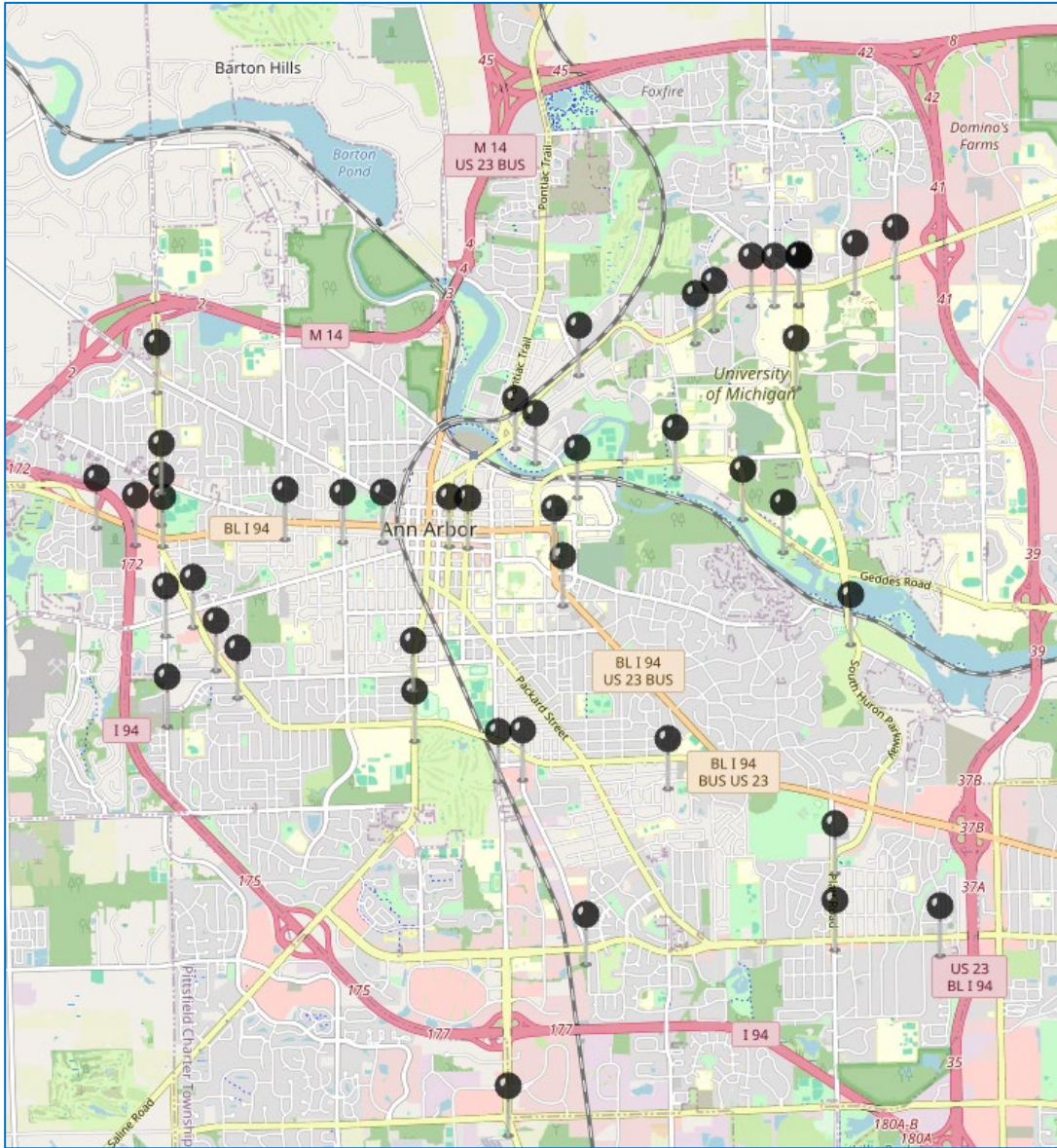


Bicycle signals are currently installed at two intersections with bicycle tracks.

- First & Huron
- Division & Huron







# Hemispherical video detection

Capable of bicycle and motor vehicle detection

Installed at 48 signalized intersections

# Future work

- Accessible pedestrian signal
- Countdown pedestrian signal head
- Rectangular rapid flashing beacon
- Bicycle signal
- Flash yellow arrow, and eliminate conflict during pedestrian service
- Near-miss analytics

