



*Gaithersburg*

A CHARACTER COUNTS! CITY

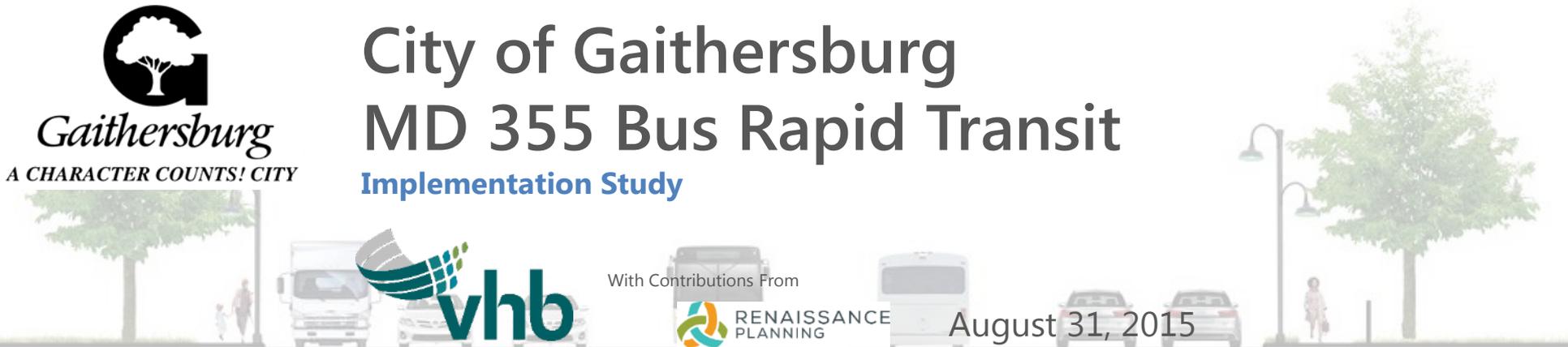
# City of Gaithersburg MD 355 Bus Rapid Transit Implementation Study



With Contributions From



August 31, 2015



# Tonight's Agenda

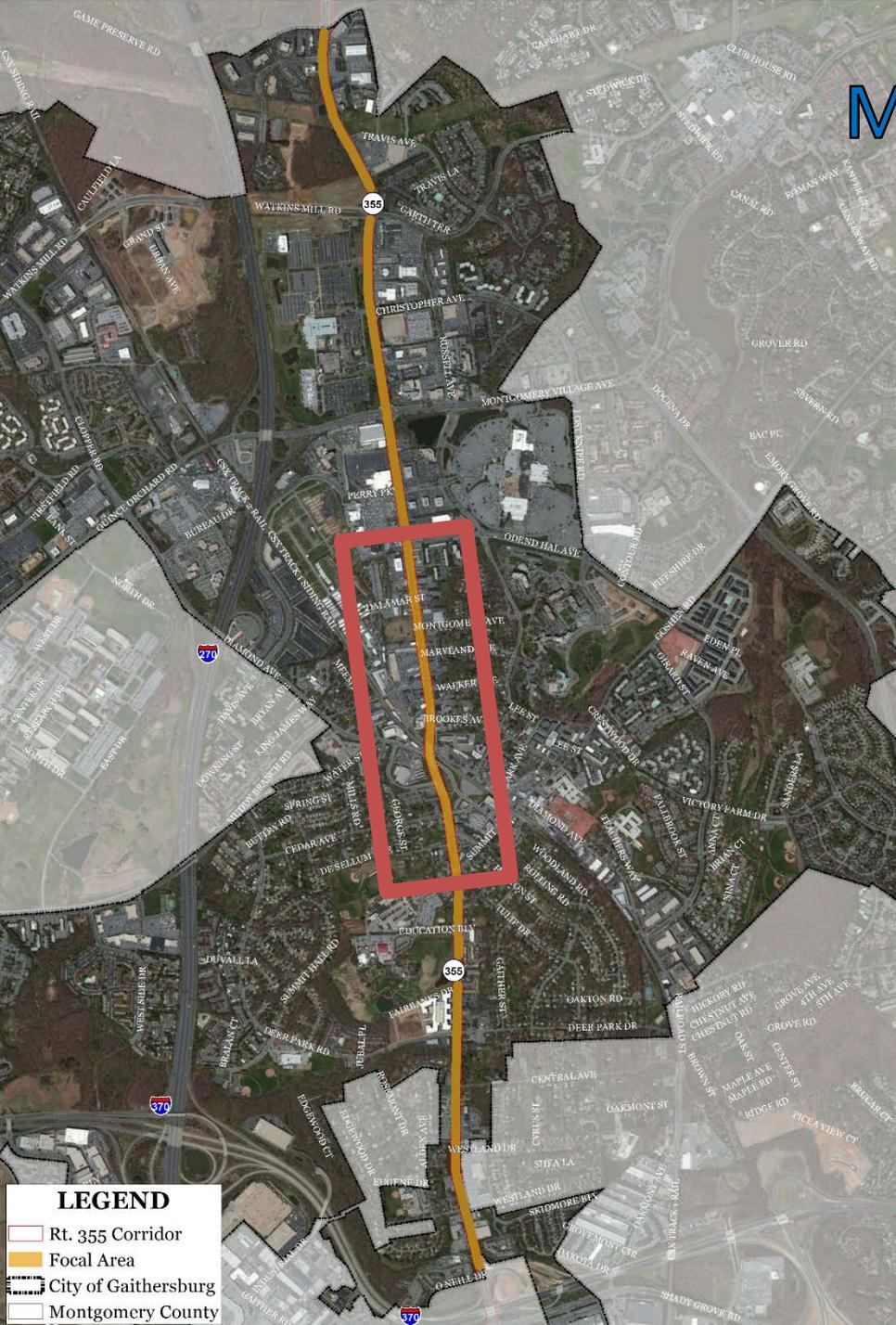
- Purpose
- MD 355 Existing Conditions
- BRT Design Alternatives
- Hybrid Design Alternative
- BRT Station Locations
- Preferred Right of Way
- Questions

# Purpose and Existing Conditions



**How can Gaithersburg accommodate BRT along MD 355?**

# MD 355 – Frederick Avenue



# Focal Study Area



# BRT Design Alternatives

# MD 355 BRT Design Alternatives

- Layout concepts developed for MD 355 focal segment
  - Mixed Traffic
  - Lane Repurposing Guideway
  - Single-lane Median Guideway
  - Dual-lane Median Guideway
- Planning-level Design Assumptions
  - MD 355 outside of focal segment will accommodate dual-lane median guideway
  - Existing traffic signals and existing turning lanes are maintained
  - No new signalized intersections
  - Median guideways provide no median breaks at unsignalized intersections
  - On-street bicycle lanes will not be provided in focal segment to minimize potential property impacts
  - Preliminary assessment of property impacts that may be avoidable in detailed design

# Mixed Traffic Concept

- No modifications to existing roadway or Father Cuddy Bridge
- BRT buses will travel in mixed traffic between Odendhal Avenue and Summit Avenue (focal segment)
- Curbside station platforms required in focal segment

# Mixed Traffic Guideway Analysis

| Alternative   | Diverted Traffic Volumes (AM/PM vehicles per hour) |                | Intersection Operations | Roadway Capacity         |
|---------------|--|----------------|-------------------------|--------------------------|
|               | Perry Parkway                                      | Russell Avenue | Level of Service (LOS)  | Passenger cars/mile/lane |
| Mixed Traffic | 0/0  | 0/0            | LOS B-C                 | 39 – Near capacity       |

- Elevated northbound vehicle delay, queuing, and congestion during weekday evening peak
- BRT operations are limited by traffic conditions
  - Peak condition queuing and congestion will degrade bus speeds
  - Average speed: **11-15 mph**

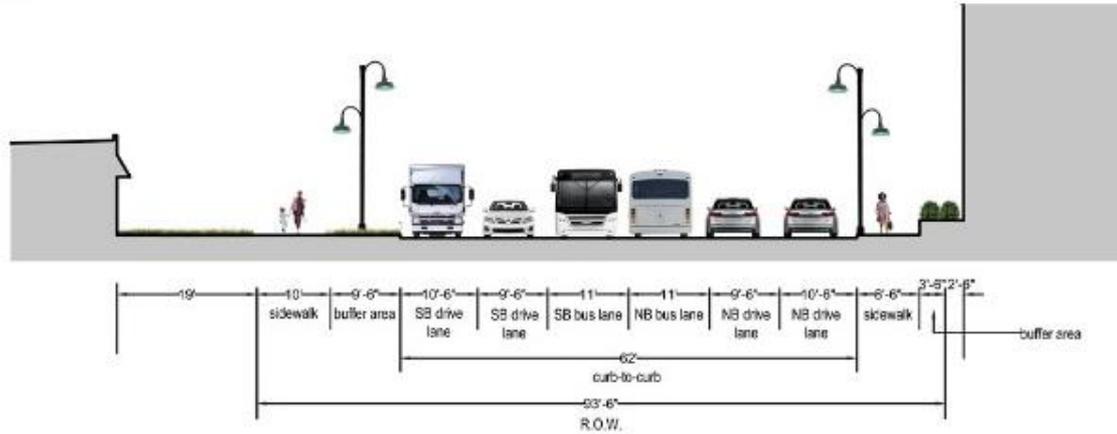
# Lane Repurposing Guideway Concept

- Modify roadway lane striping and install buffer/separators between BRT lanes and mixed traffic lanes
- Minimize right of way requirements in focal segment
- Southbound traffic lane eliminated north of Chestnut Street
- Northbound traffic lane eliminated from Summit to Brookes
- Accommodates BRT on existing Father Cuddy Bridge

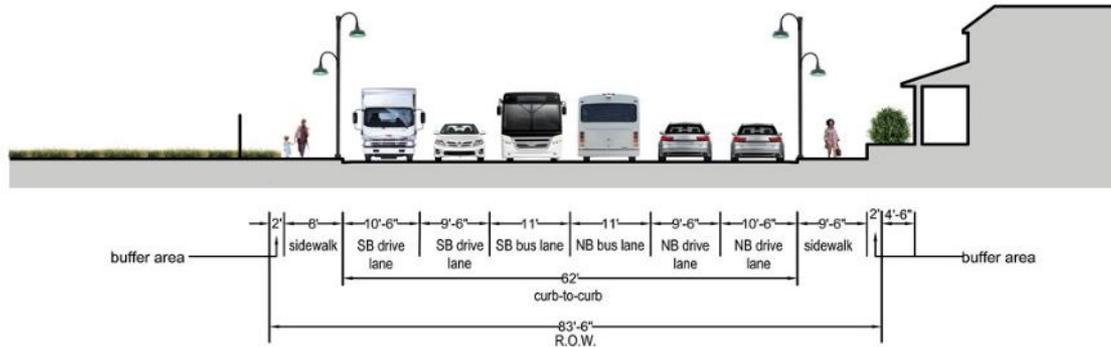
# Lane Repurposing

south of  
Whetstone

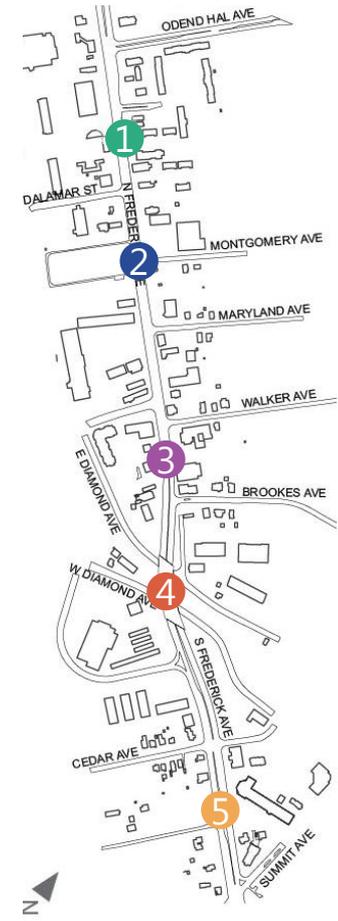
1.G LANE REPURPOSING ALTERNATIVE



2.G LANE REPURPOSING ALTERNATIVE



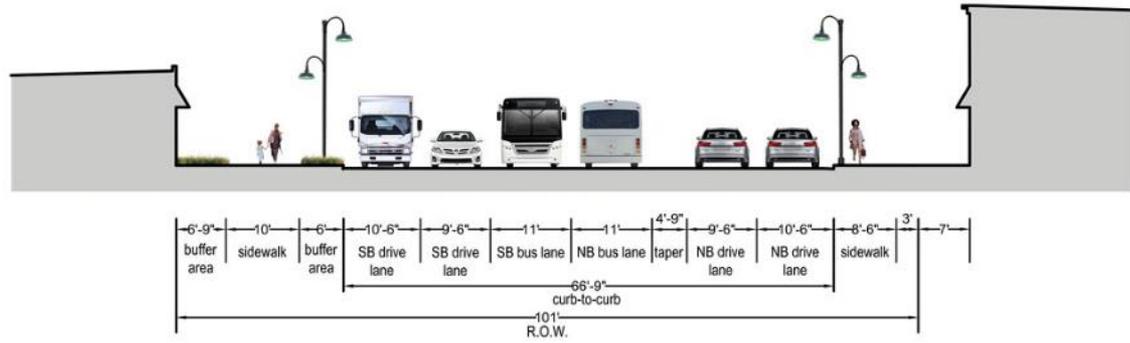
@ Montgomery



# Lane Repurposing

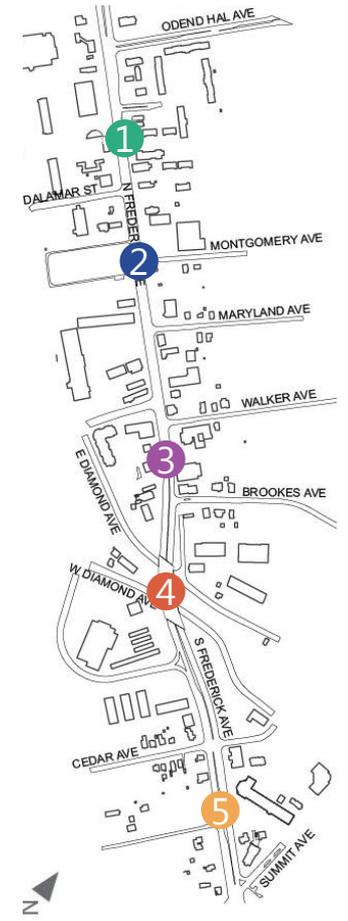
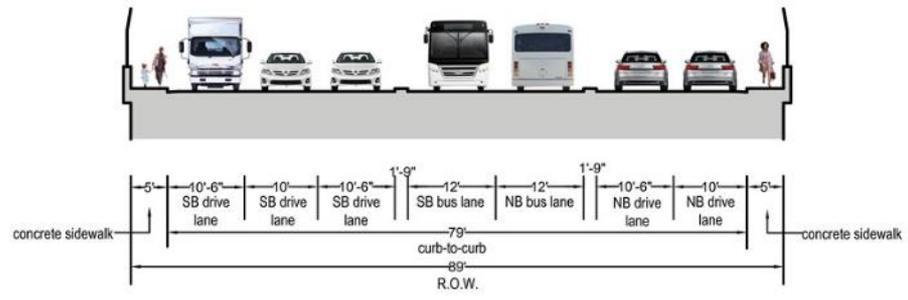
## 3.G LANE REPURPOSING ALTERNATIVE

between Brookes & Walker



## 4.G LANE REPURPOSING ALTERNATIVE

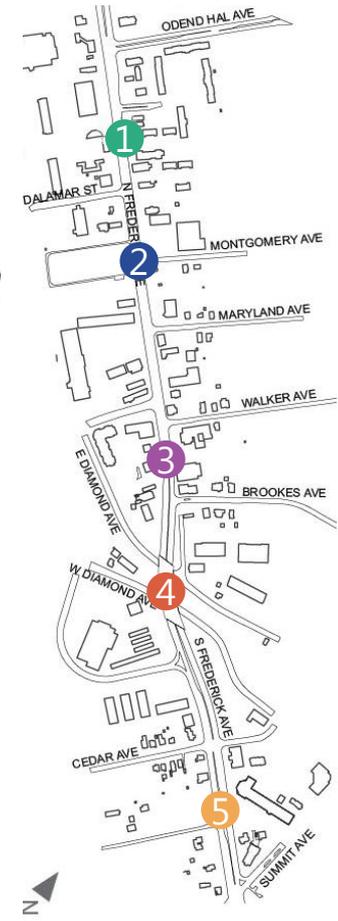
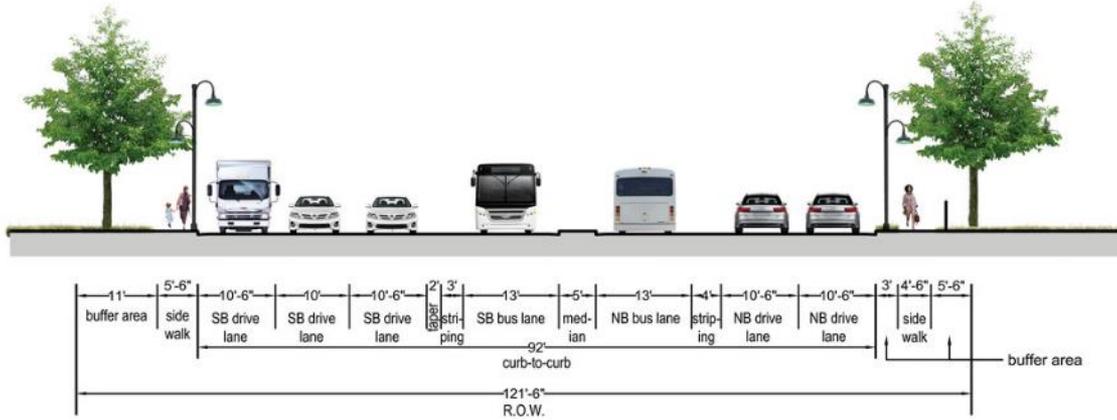
@ Father Cuddy Bridge



# Lane Repurposing

north of DeSellum

## 5.G LANE REPURPOSING ALTERNATIVE



# Lane Repurposing Layout Concept



# Lane Repurposing Guideway Analysis

| Alternative               | Diverted Traffic Volumes (AM/PM vehicles per hour) |                | Intersection Operations | Roadway Capacity         |
|---------------------------|--|----------------|-------------------------|--------------------------|
|                           | Perry Parkway                                      | Russell Avenue | Level of Service (LOS)  | Passenger cars/mile/lane |
| Lane Repurposing Guideway | 82/113   | 159/232        | LOS B-C                 | 44 – At capacity         |

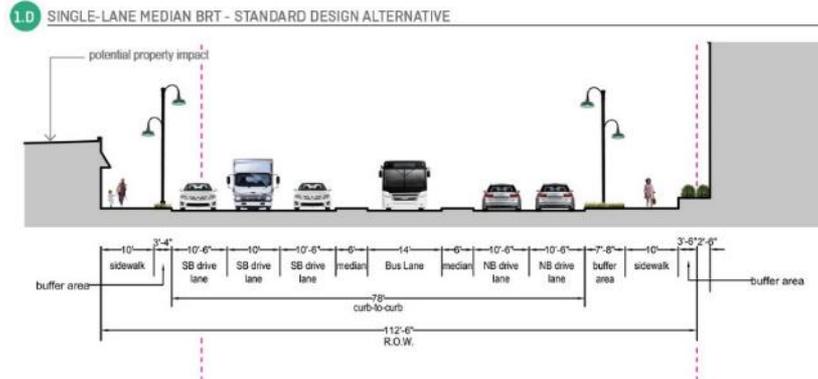
- Concept results in significantly elevated southbound vehicle delay, queuing, and congestion during weekday morning peak
- BRT operations are challenged
  - Narrow BRT lanes and minimal separation from traffic
  - Average speed: **13-18 mph**

# Single-lane Median Guideway Concepts

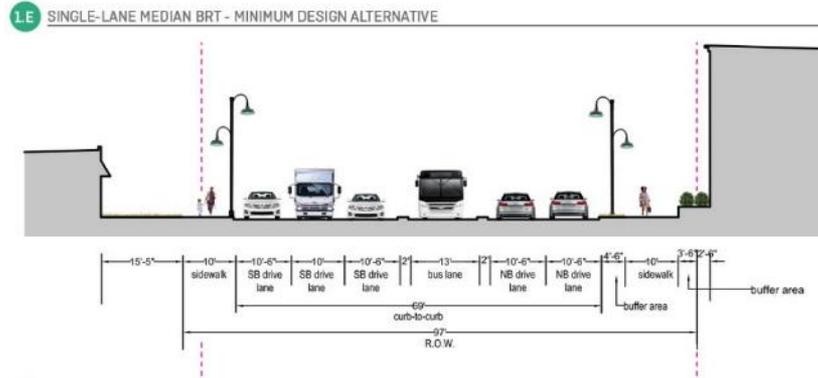
- Standard & Minimum Alternatives
  - Maintain all existing traffic lanes
  - Bridge reconstruction necessary
- Reduced Impact Alternative
  - One southbound traffic lane eliminated between Odendhal and Chestnut
  - Accommodates BRT on existing Father Cuddy Bridge

# Single-lane Median (south of Whetstone Dr.)

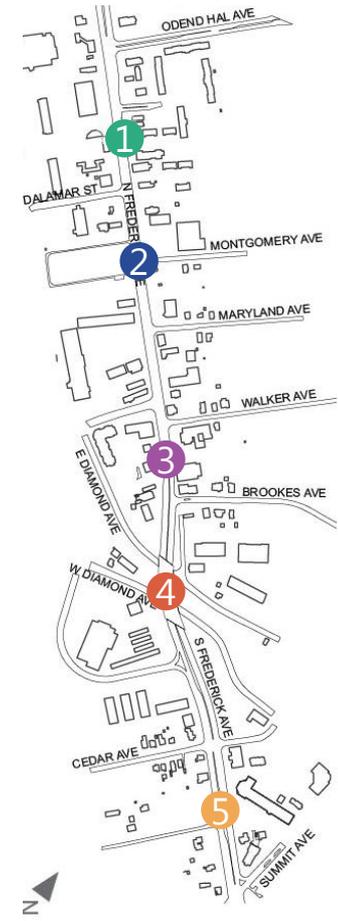
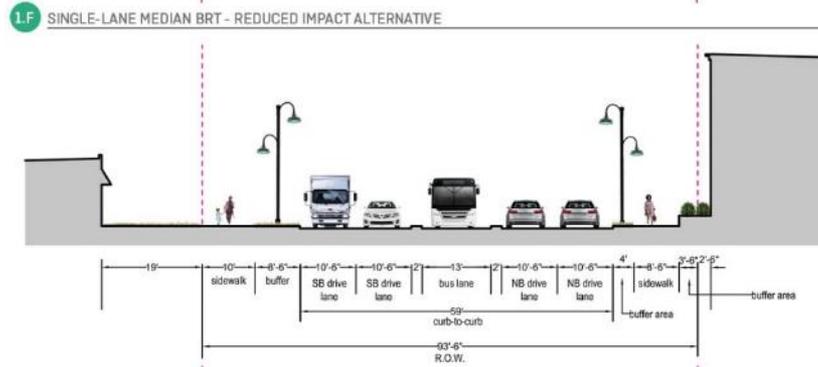
Standard



Minimum

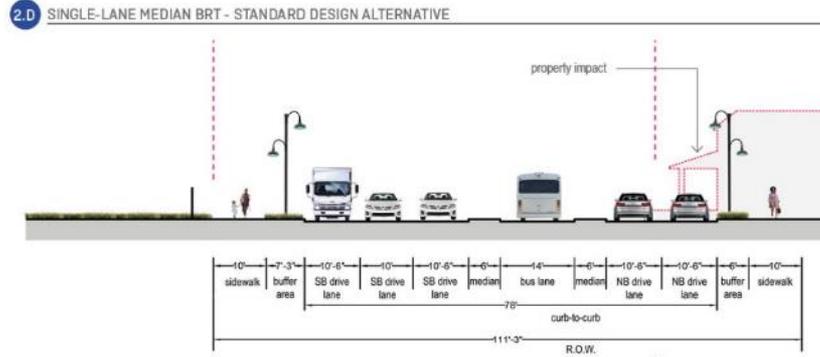


Reduced Impact

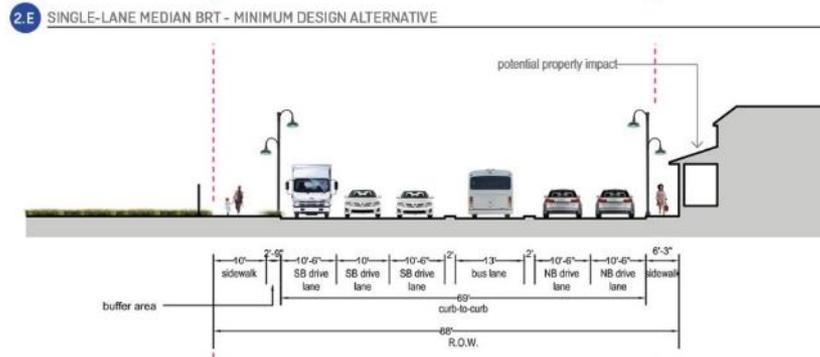


# Single-lane Median (at Montgomery Ave.)

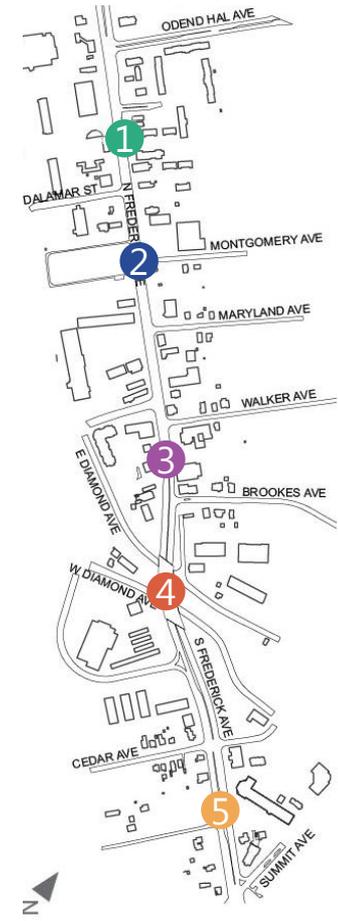
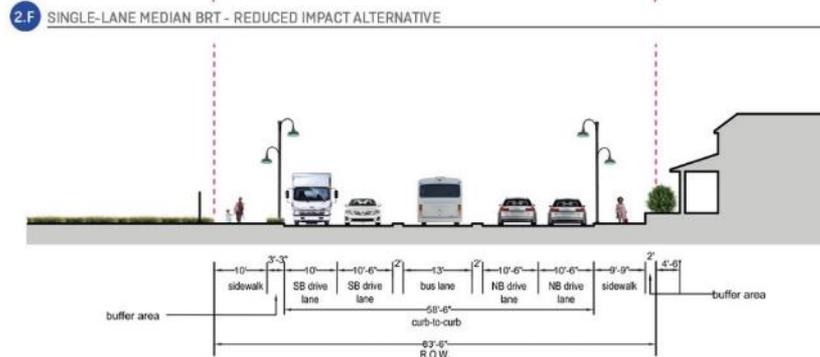
Standard



Minimum

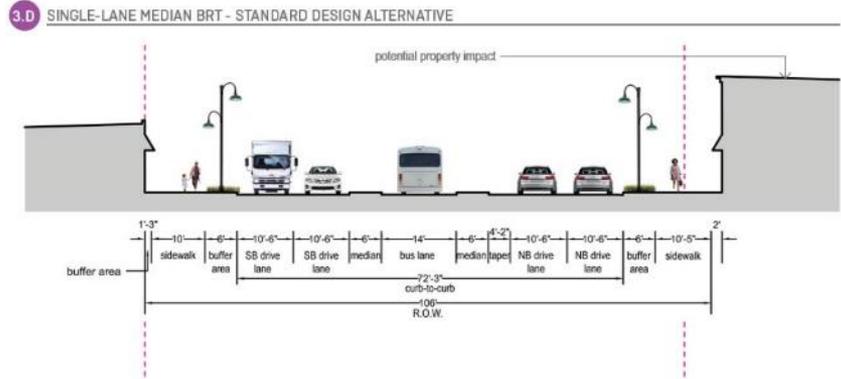


Reduced Impact

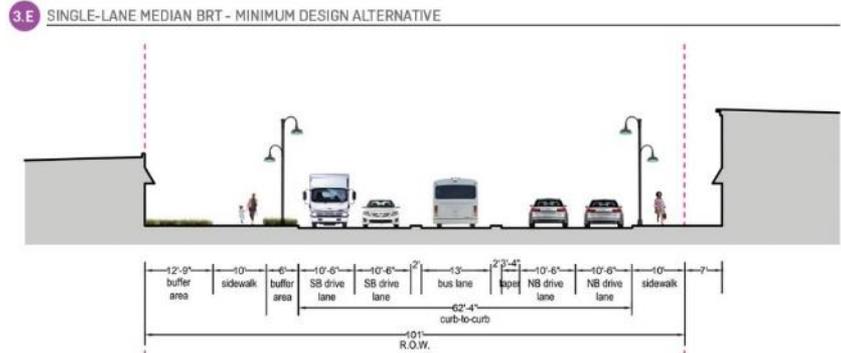


# Single-lane Median (between Brookes & Walker)

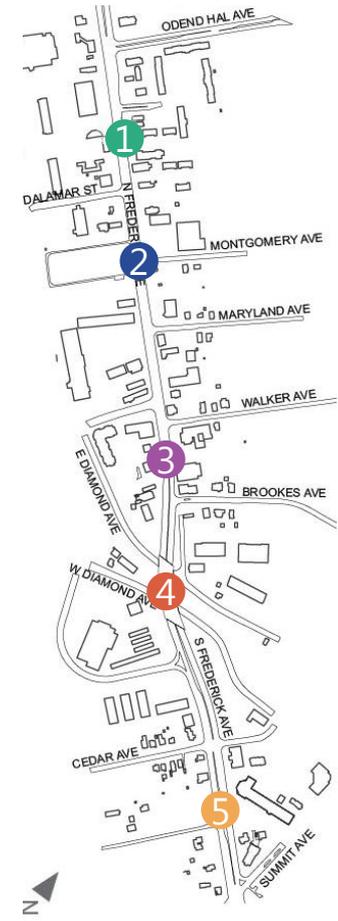
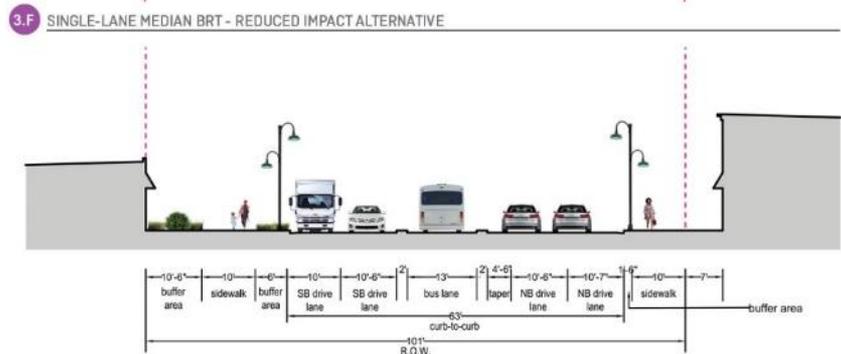
Standard



Minimum

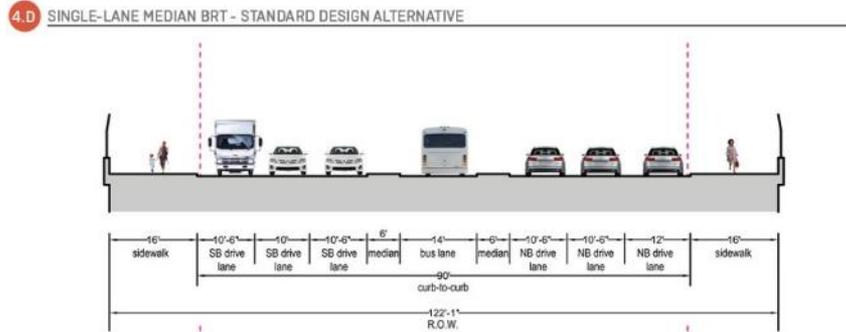


Reduced Impact

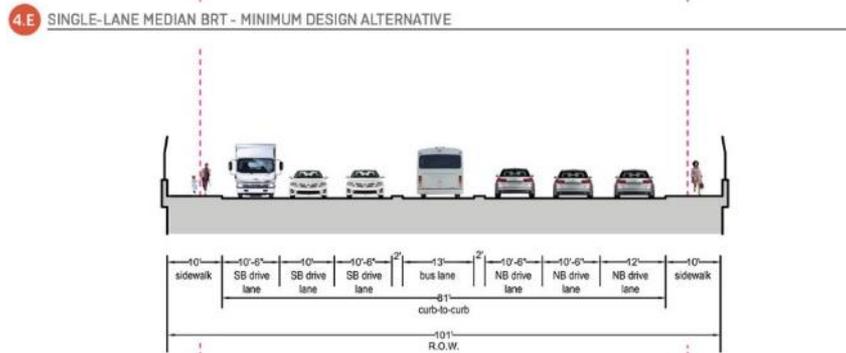


# Single-lane Median (at Father Cuddy Bridge)

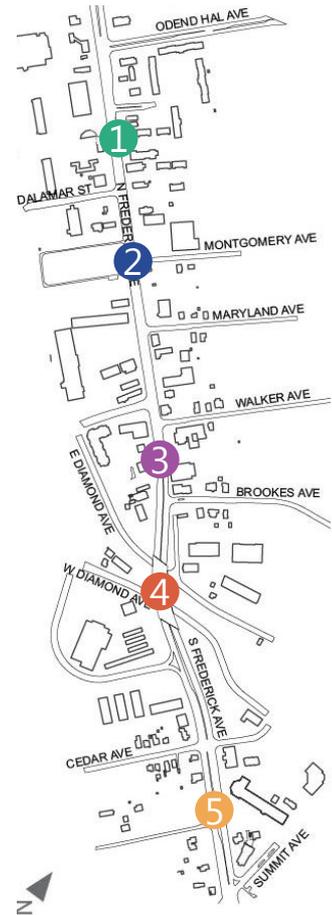
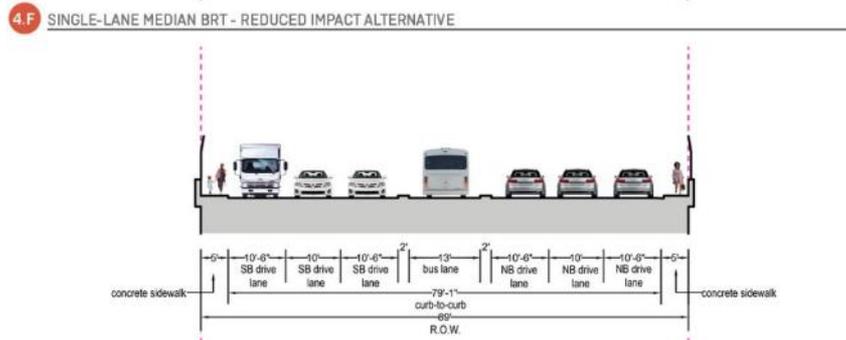
Standard



Minimum

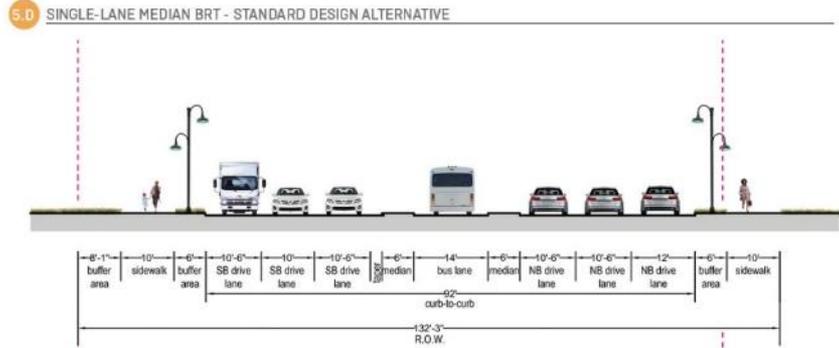


Reduced Impact

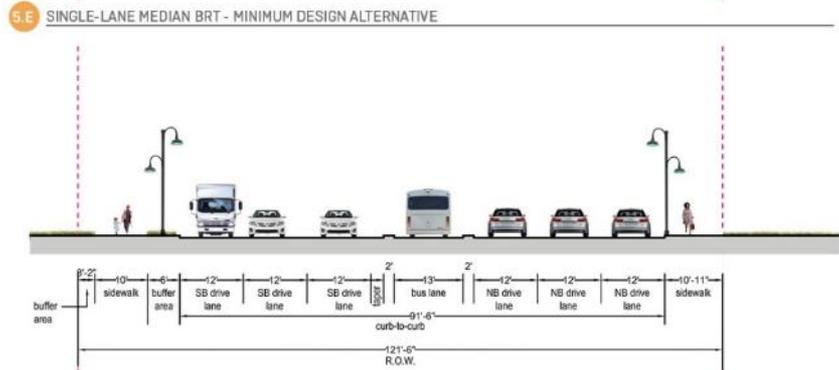


# Single-lane Median (north of DeSillum Ave.)

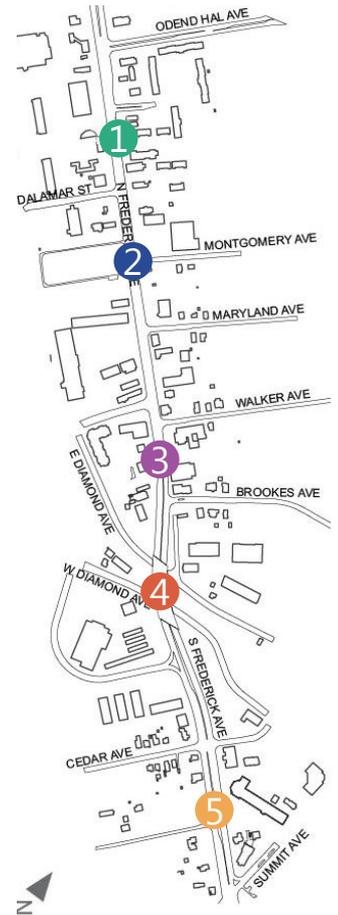
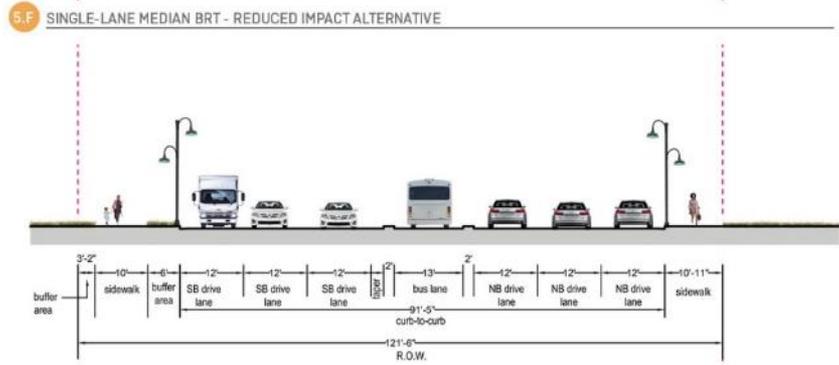
Standard



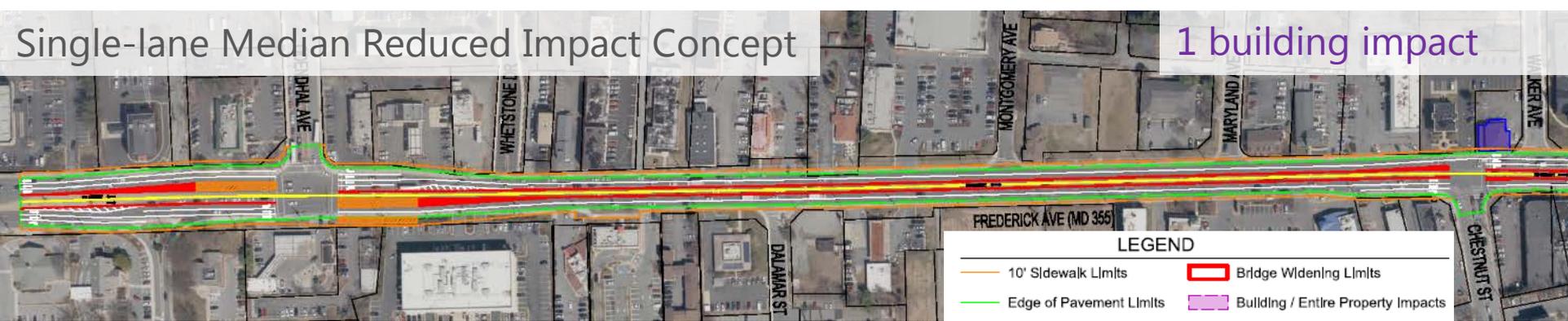
Minimum



Reduced Impact



# Single-lane Median Guideway Layout Concepts



FREDERICK AVE (MD 355)

LEGEND

- 10' Sidewalk Limits
- Edge of Pavement Limits
- BRT Medlans
- Proposed Station
- Bridge Widening Limits
- Building / Entire Property Impacts
- Potential Building Impacts

# Single-lane Median Guideway Analysis

| Alternative                | Diverted Traffic Volumes (AM/PM vehicles per hour) |                | Intersection Operations | Roadway Capacity         |
|----------------------------|--|----------------|-------------------------|--------------------------|
|                            | Perry Parkway                                      | Russell Avenue | Level of Service (LOS)  | Passenger cars/mile/lane |
| Single-lane Standard       | 14/40  | 123/192        | LOS B-D                 | 37 – Near capacity       |
| Single-lane Minimum        | 14/40  | 123/192        | LOS B-D                 | 37 – Near capacity       |
| Single-lane Reduced Impact | 74/104   | 146/217        | LOS B-C                 | <b>44 – At capacity</b>  |

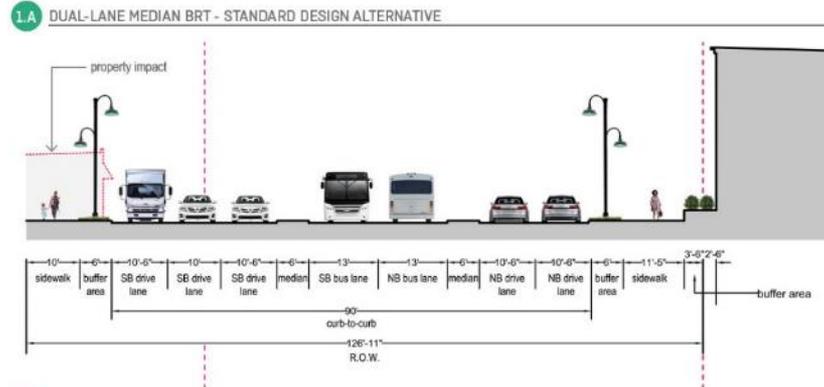
- Reduced Impact concept results in significantly elevated southbound vehicle delay, queuing, and congestion during weekday morning peak
- Single-lane Median Guideway BRT operations
  - Reversible Operation Average speed: **18-22 mph** in guideway; **11-15 mph** in mixed traffic
  - Bi-directional Operations: **18-22 mph** in guideway; 5 minute maximum frequency

# Dual-lane Median Guideway Concepts

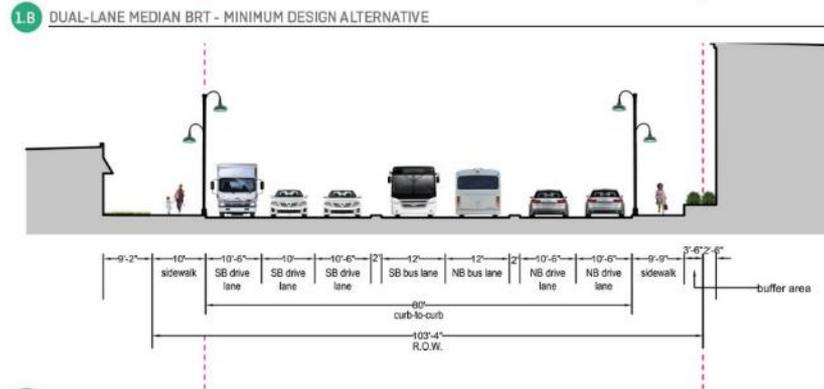
- Standard & Minimum Alternatives
  - Maintains all existing traffic lanes
  - Bridge reconstruction necessary
- Reduced Impact Alternative
  - One southbound traffic lane eliminated between Odendhal and Chestnut
  - One northbound traffic lane eliminated between Cedar and Brookes
  - Accommodates BRT on existing Father Cuddy Bridge

# Dual-lane Median (south of Whetstone Dr.)

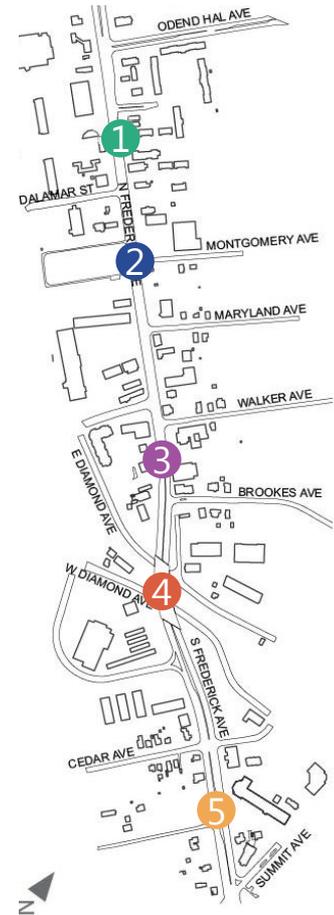
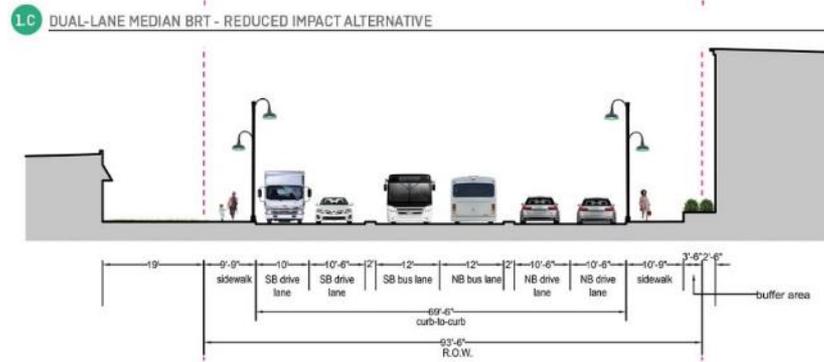
Standard



Minimum

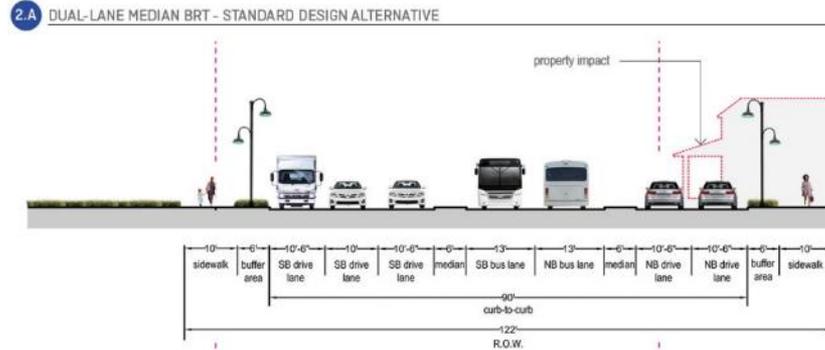


Reduced Impact

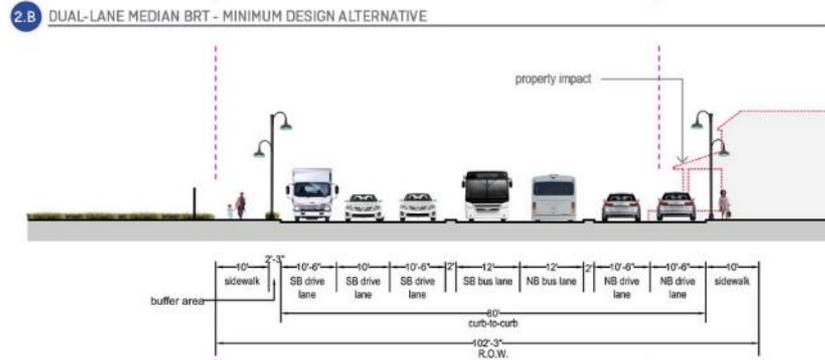


# Dual-lane Median (at Montgomery Ave.)

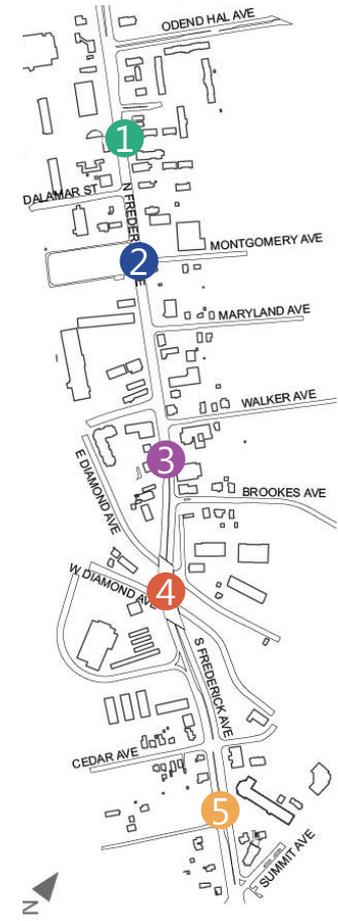
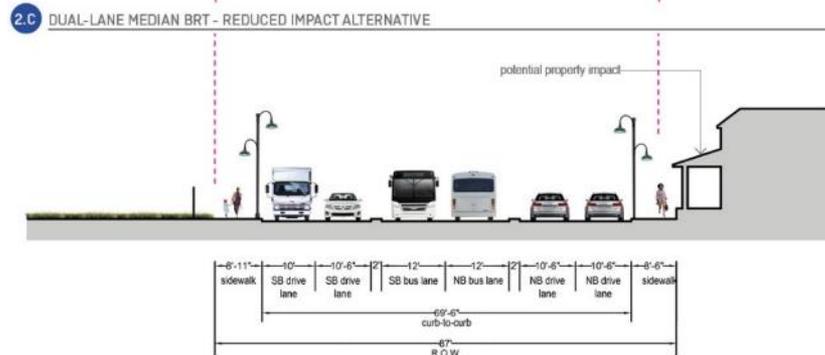
Standard



Minimum

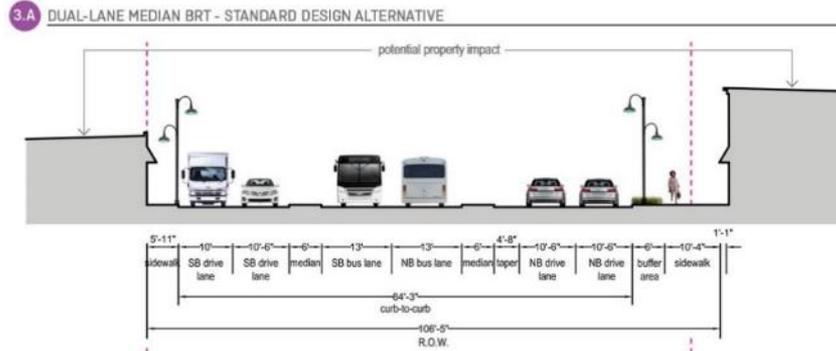


Reduced Impact

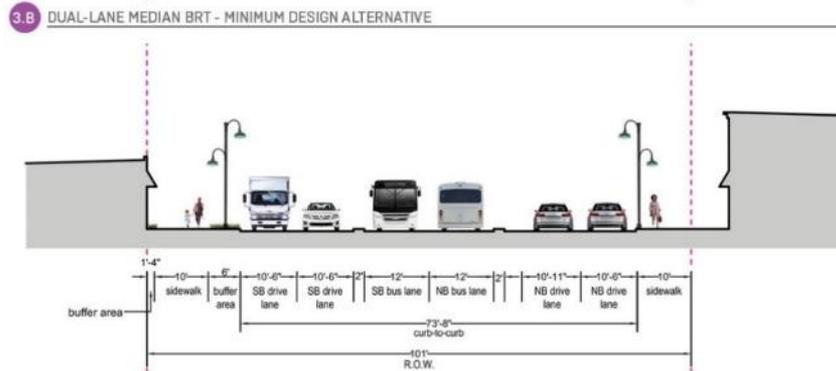


# Dual-lane Median (between Brookes & Walker)

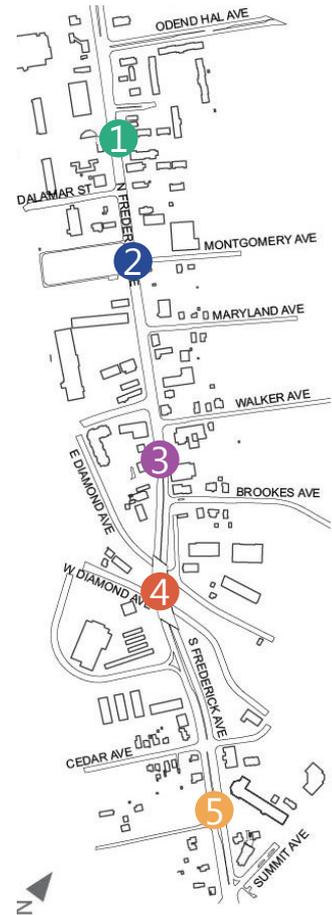
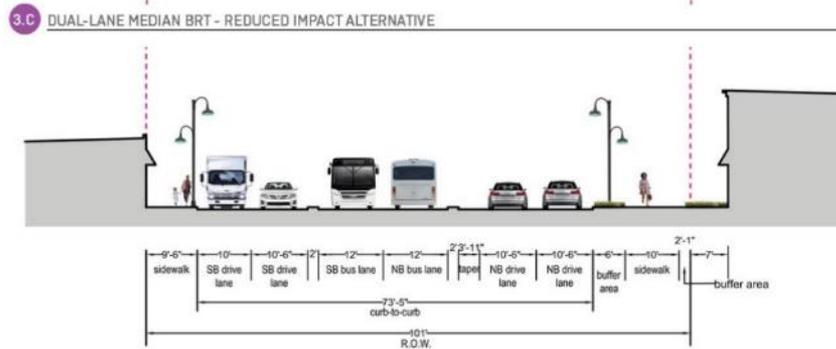
Standard



Minimum

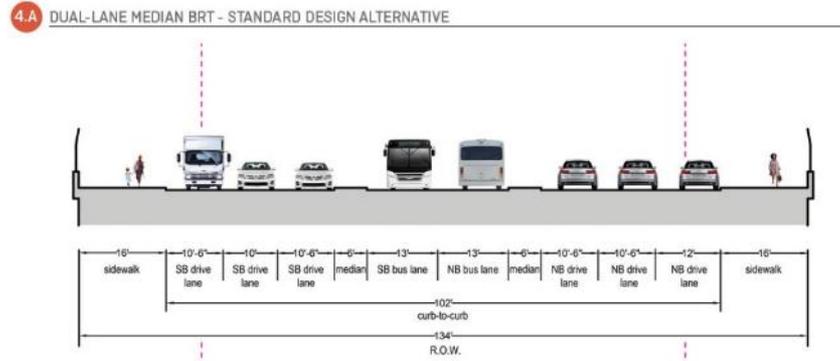


Reduced Impact

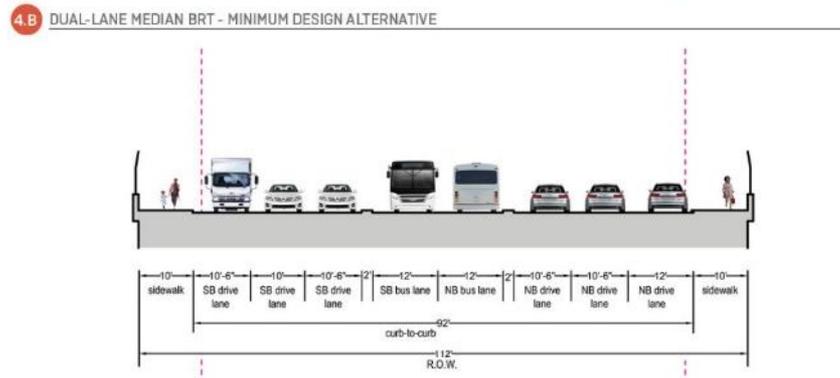


# Dual-lane Median (at Father Cuddy Bridge)

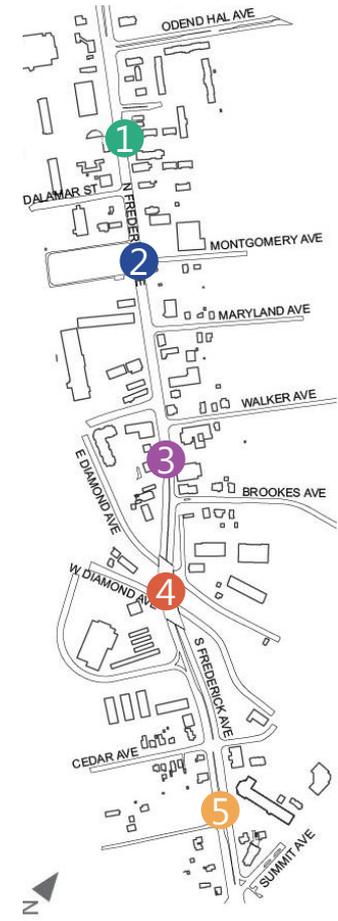
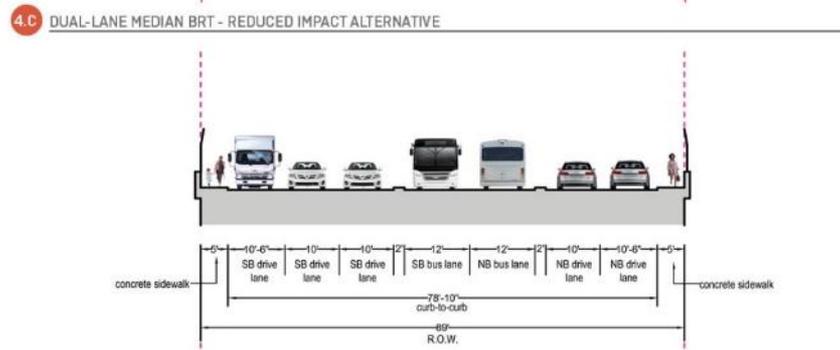
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Minimum

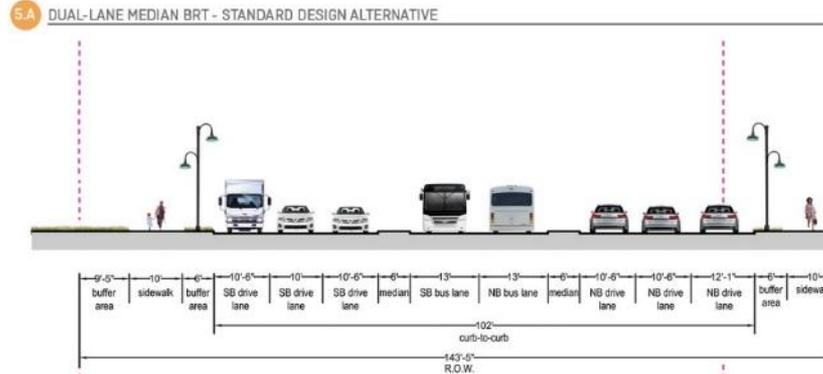


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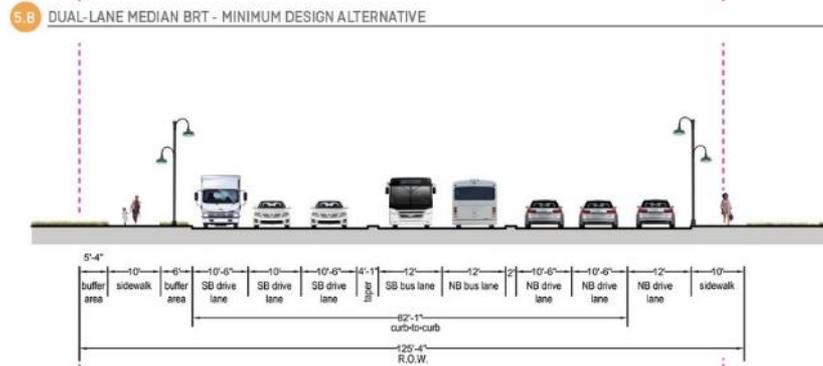


# Dual-lane Median (north of DeSillum Ave.)

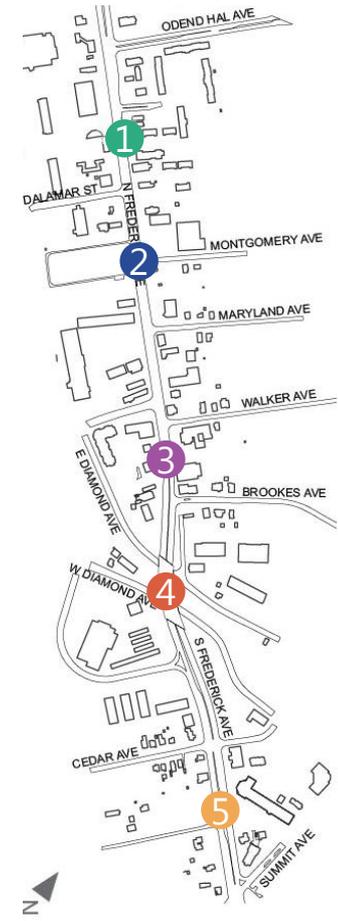
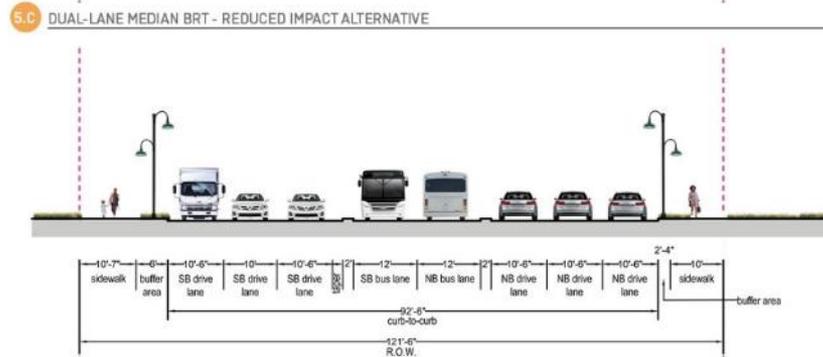
Standard



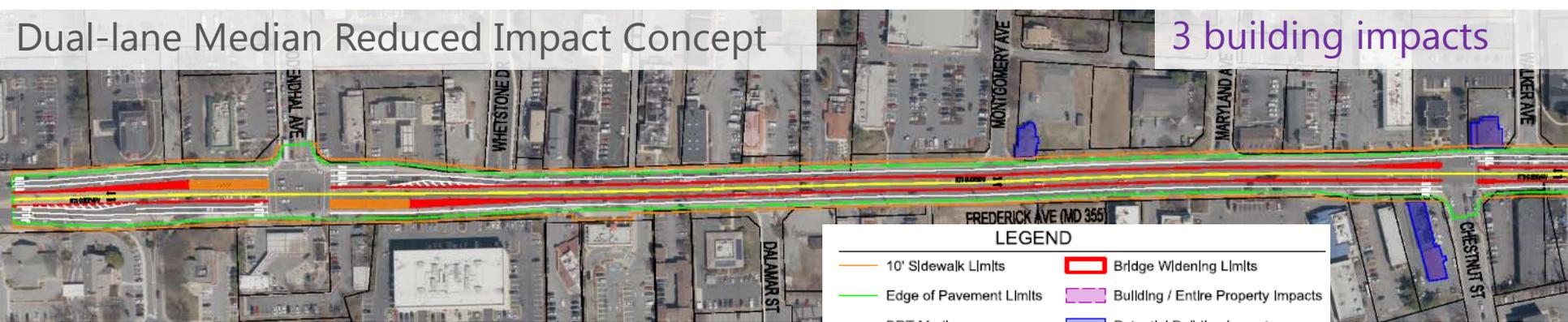
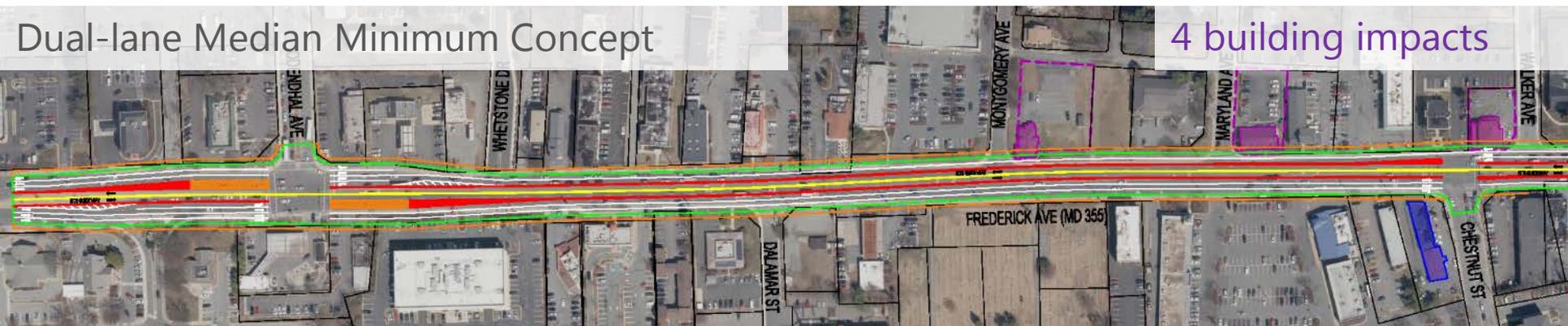
Minimum



Reduced Impact



# Dual-lane Median Guideway Layout Concepts



# Dual-lane Median Guideway Analysis

| Alternative              | Diverted Traffic Volumes (AM/PM vehicles per hour) |                | Intersection Operations | Roadway Capacity         |
|--------------------------|--|----------------|-------------------------|--------------------------|
|                          | Perry Parkway                                      | Russell Avenue | Level of Service (LOS)  | Passenger cars/mile/lane |
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| Dual-lane Minimum        | 14/40  | 123/192        | LOS B-D                 | 37 – Near capacity       |
| Dual-lane Reduced Impact | 82/113   | 159/232        | LOS B-C                 | <b>44 – At capacity</b>  |

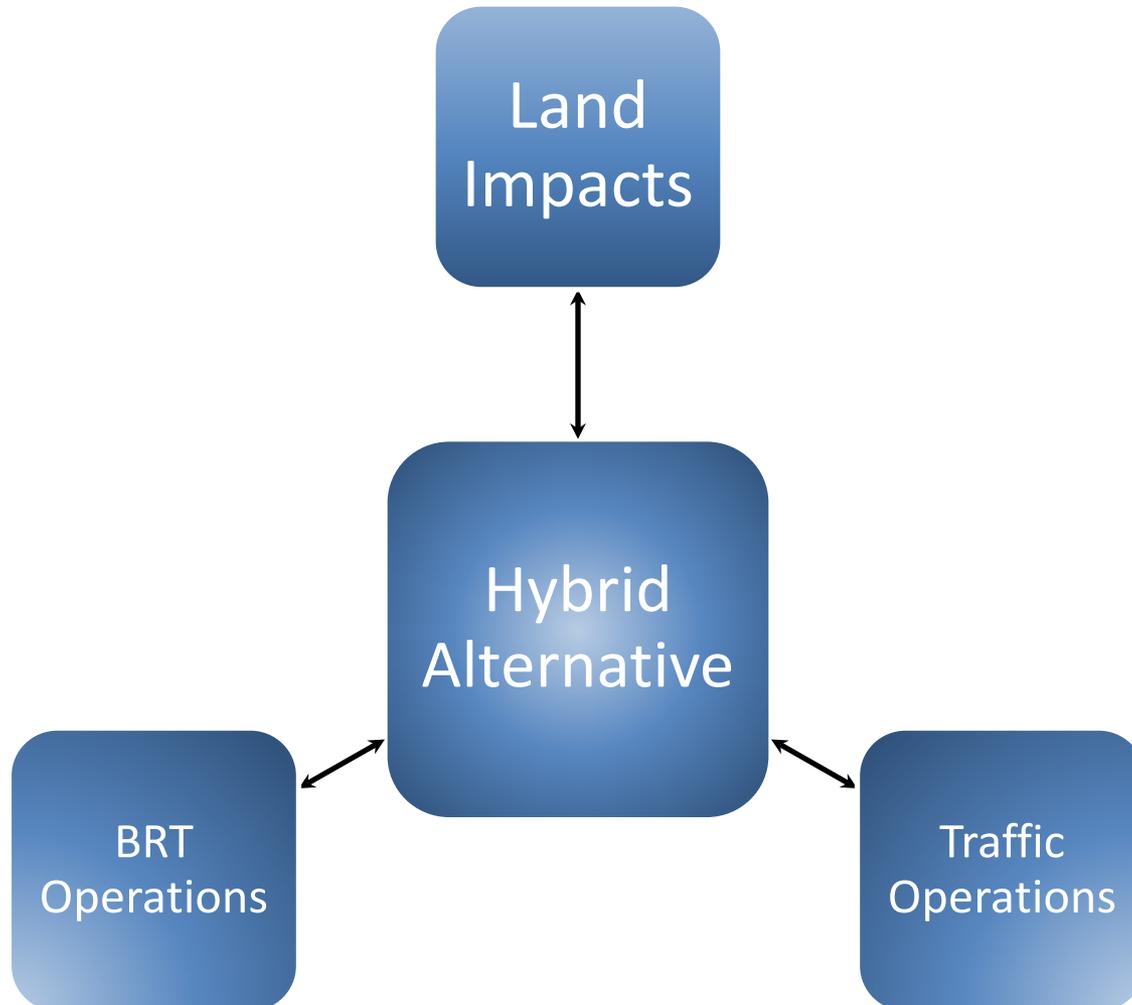
- Reduced Impact concept results in significantly elevated southbound vehicle delay, queuing, and congestion during weekday morning peak
- BRT operations
  - Optimal performance with average speed: **18-22 mph**



The background is a solid green color with a complex, abstract pattern of white lines. The pattern consists of various geometric shapes, including squares, rectangles, and circles, arranged in a way that suggests a grid or a series of overlapping planes. The lines are thin and light, creating a subtle, textured effect. The overall composition is balanced and modern.

# Hybrid Design Alternative

# Balanced Approach

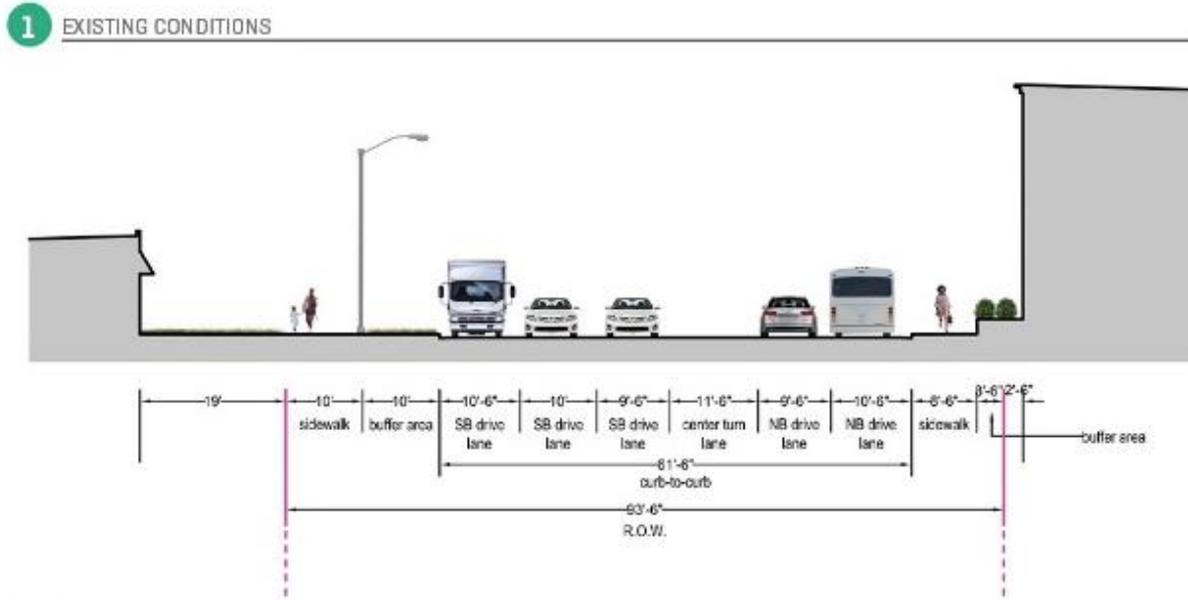


# Hybrid Alternative Guideway Concept

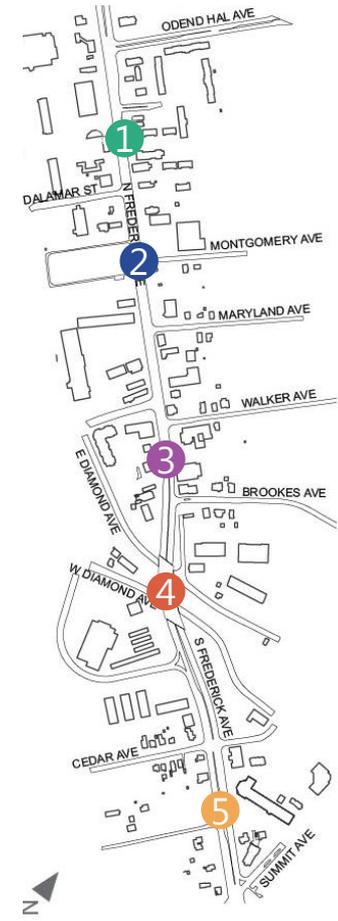
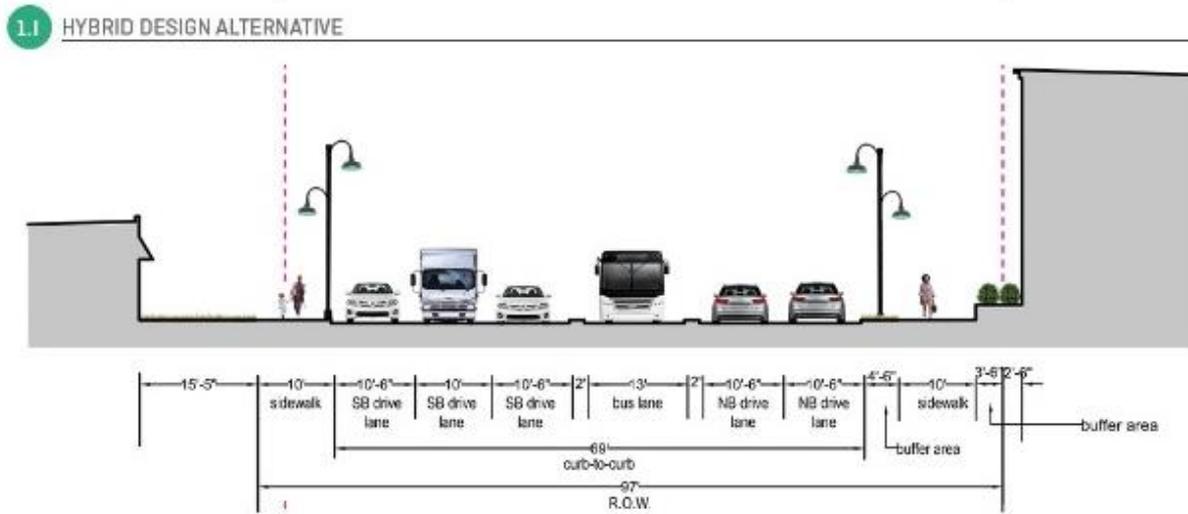
- Adopts aspects of both Dual-lane and Single-lane guideway concepts
  - Single-lane Minimum concept from Odendhal to Chestnut
  - Dual-lane Minimum/Reduced Impact elements from Chestnut to Summit
  - Traffic signal systems required for transition between dual- and single-lane guideways
- Northbound MD 355 merges to two lanes south of Father Cuddy Bridge
- Minimizes right of way requirements in focal segment
- Accommodates BRT on existing Father Cuddy Bridge

# Hybrid Alternative (south of Whetstone Dr.)

Existing



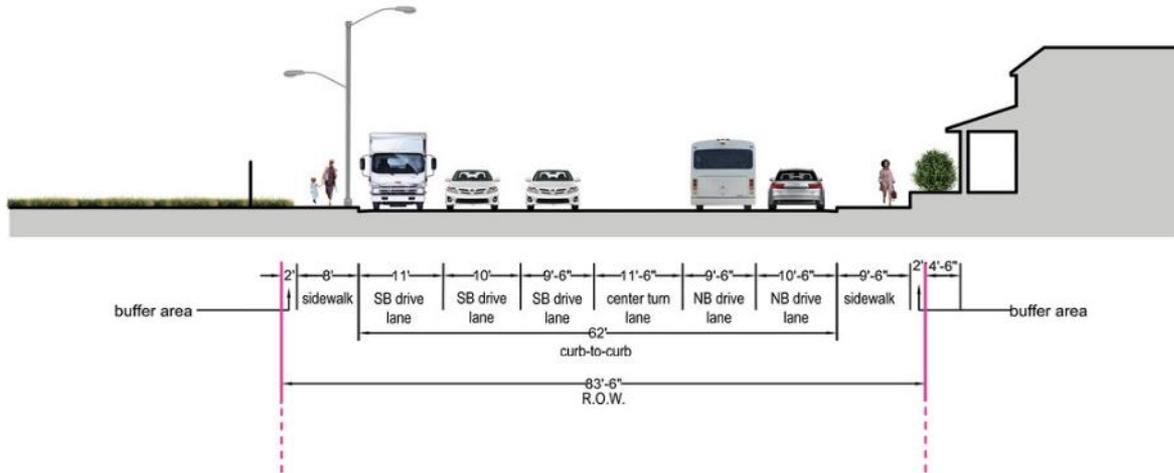
Hybrid



# Hybrid Alternative (at Montgomery Ave.)

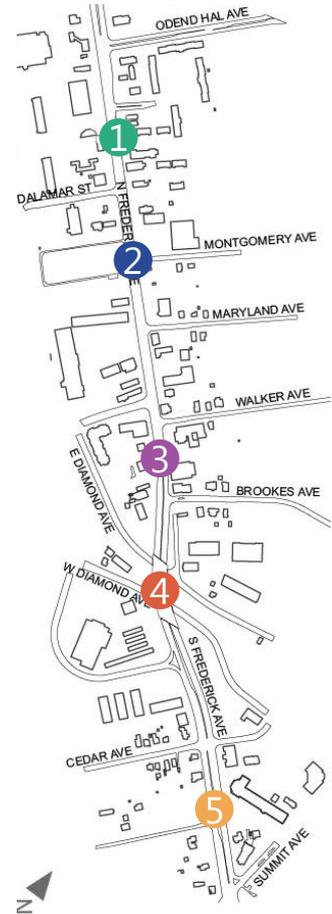
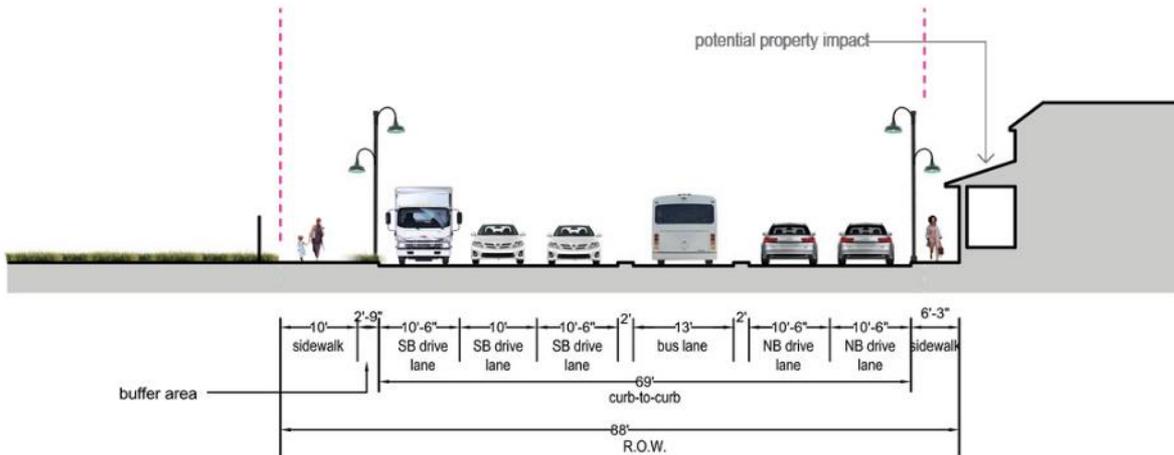
## 2 EXISTING CONDITIONS

Existing



## 2.1 HYBRID DESIGN ALTERNATIVE

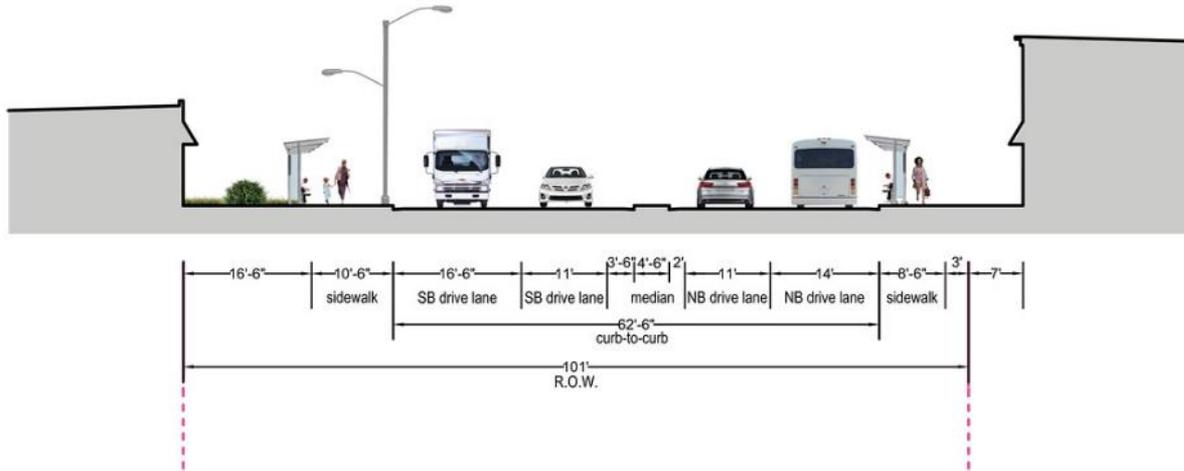
Hybrid



# Hybrid Alternative (between Brookes and Walker)

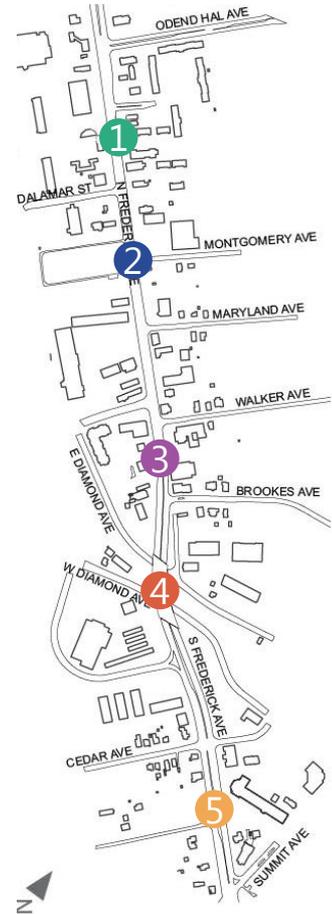
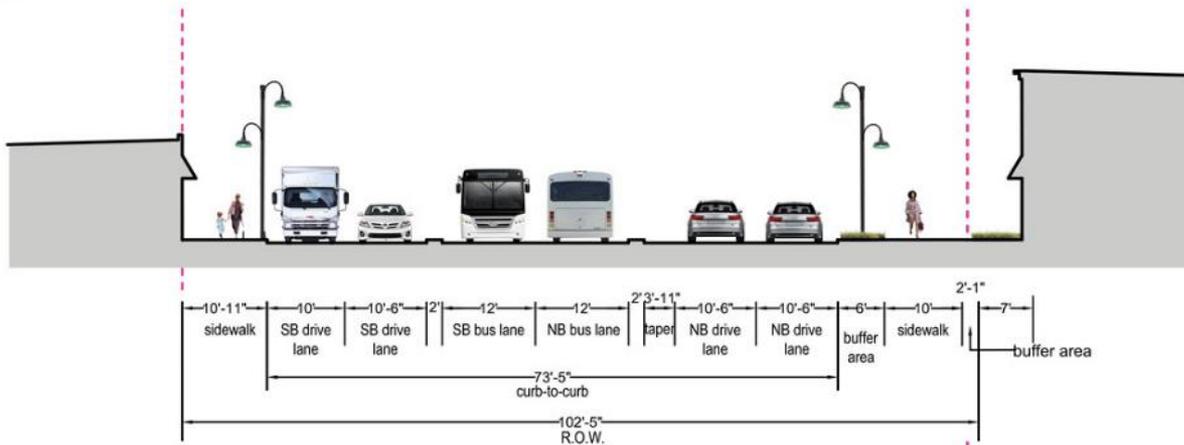
## 3 EXISTING CONDITIONS

Existing



## 3.1 DUAL-LANE MEDIAN BRT - HYBRID DESIGN ALTERNATIVE

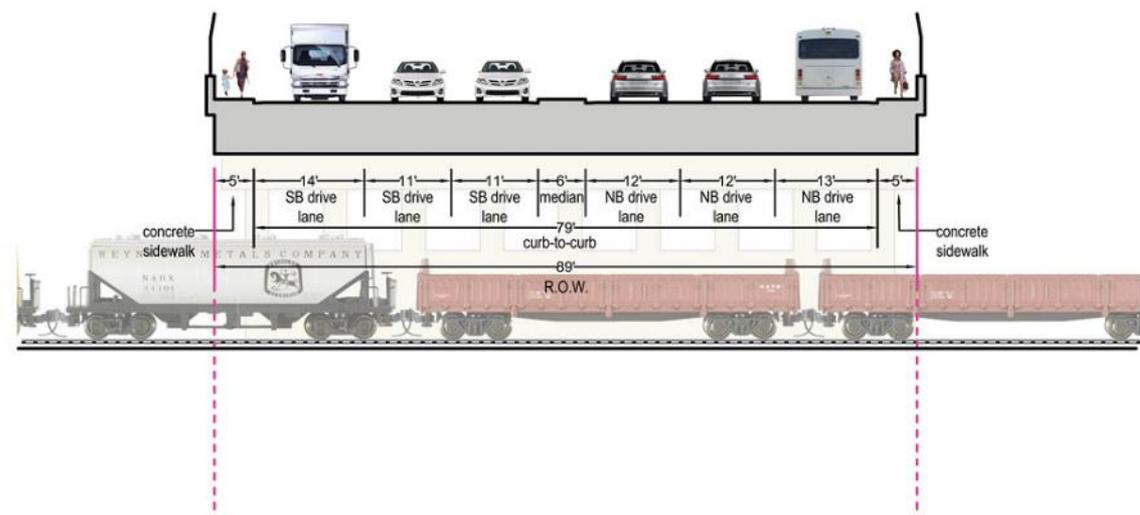
Hybrid



# Hybrid Alternative (at Father Cuddy Bridge)

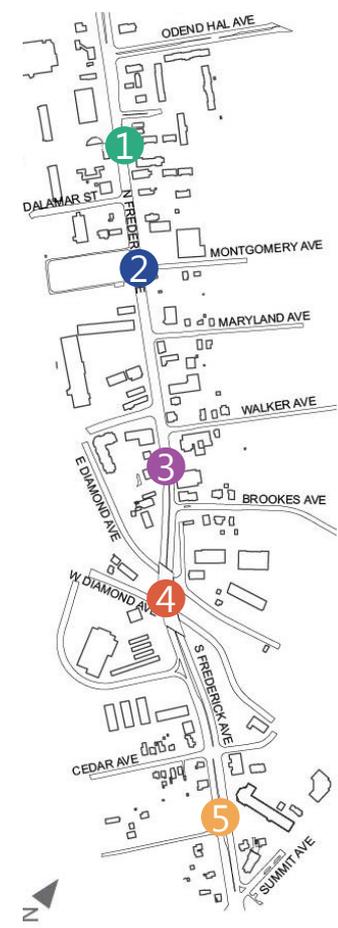
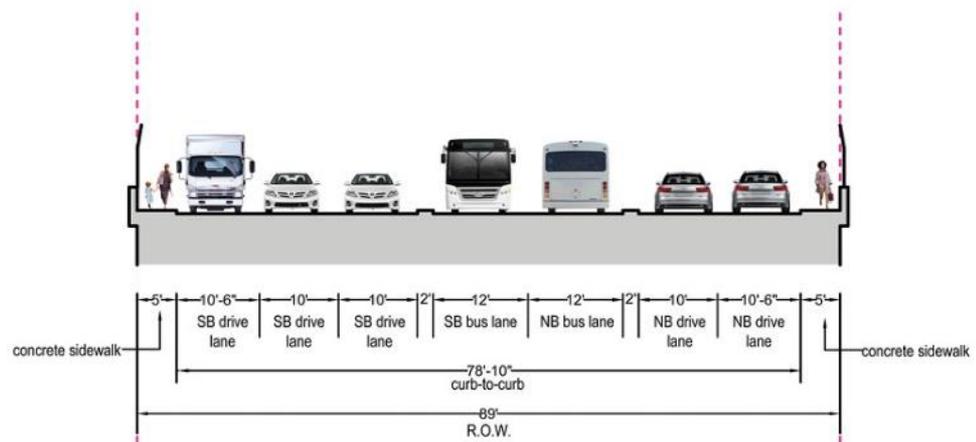
## 4 EXISTING CONDITIONS

Existing



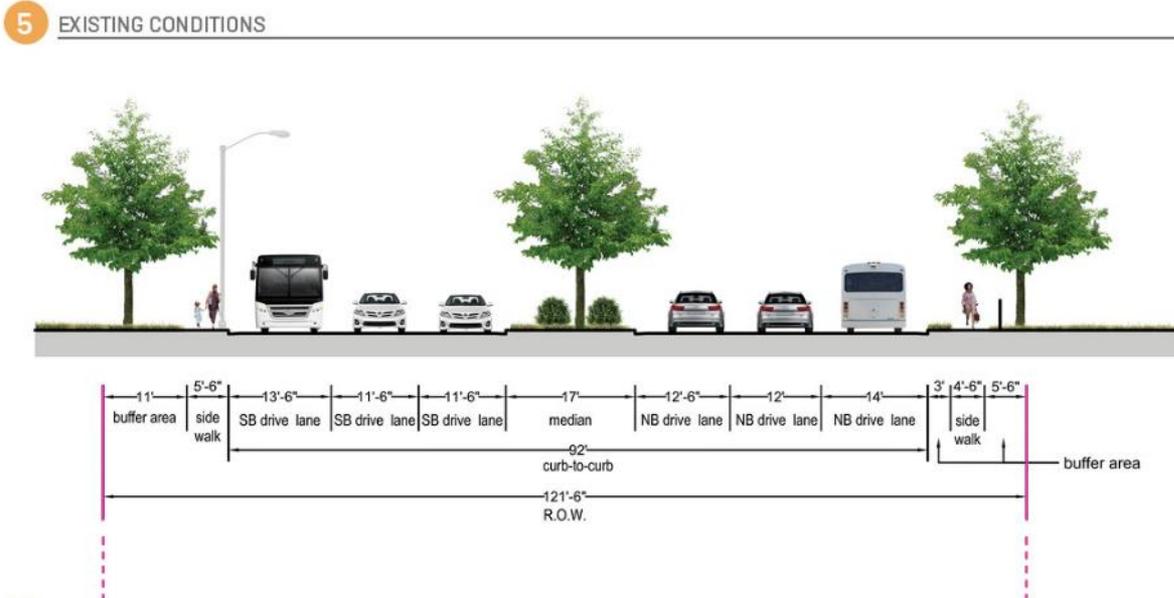
## 4.1 HYBRID DESIGN ALTERNATIVE

Hybrid

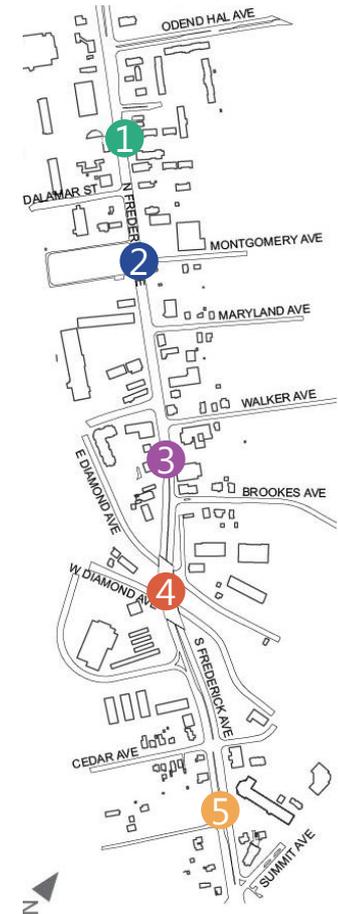
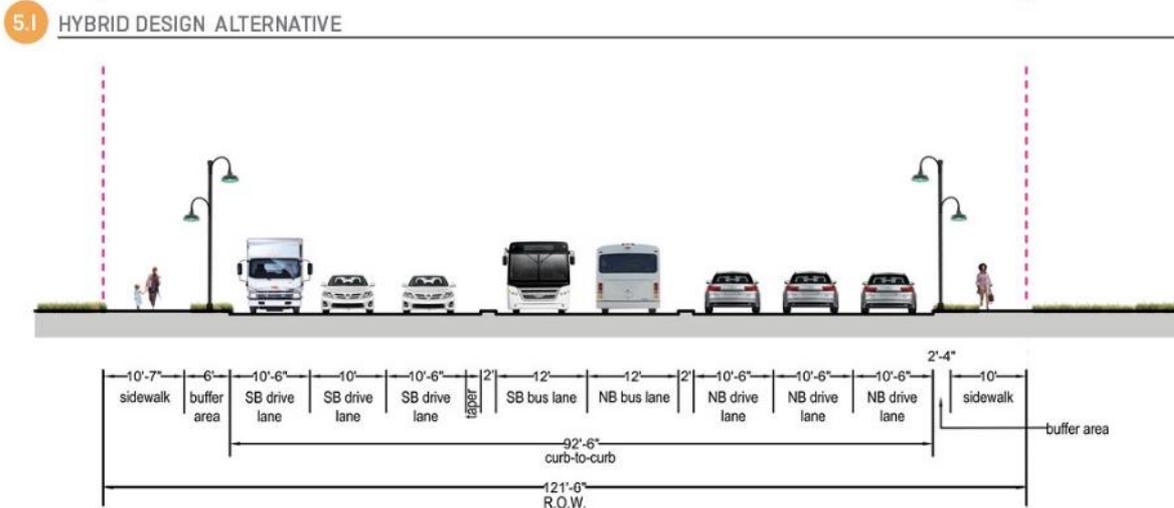


# Hybrid Alternative (north of DeSillum Ave.)

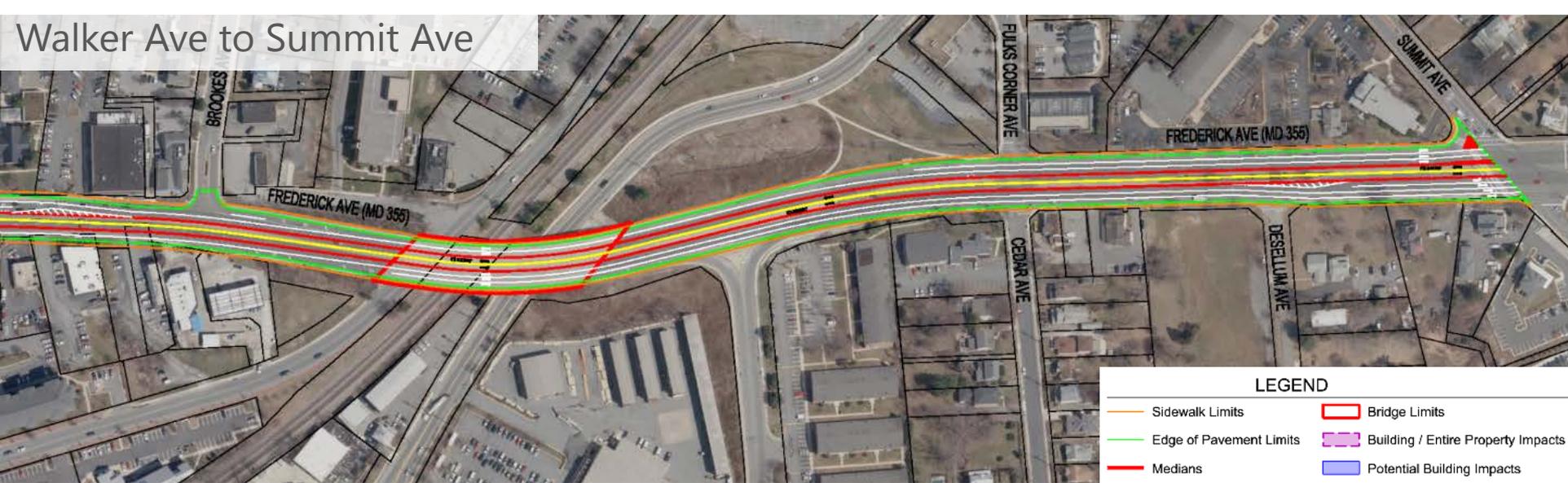
Existing



Hybrid



# Hybrid Alternative Layout Concept



# Hybrid Alternative Guideway Analysis

| Alternative                 | Diverted Traffic Volumes (AM/PM vehicles per hour) |                | Intersection Operations | Roadway Capacity         |
|-----------------------------|--|----------------|-------------------------|--------------------------|
|                             | Perry Parkway                                      | Russell Avenue | Level of Service (LOS)  | Passenger cars/mile/lane |
| Hybrid Alternative Guideway | 36/65  | 143/213        | LOS B-D                 | 36 – Near capacity       |

- Lowest impact on traffic operations
- BRT operations
  - Combination of dual-lane and single-lane median guideway
  - Dual-lane guideway average speed: **18-22 mph**
  - Single-lane guideway segment is shorter than other alternatives
  - Signal coordination required for bi-directional bus travel, or non-peak direction buses use general traffic lanes

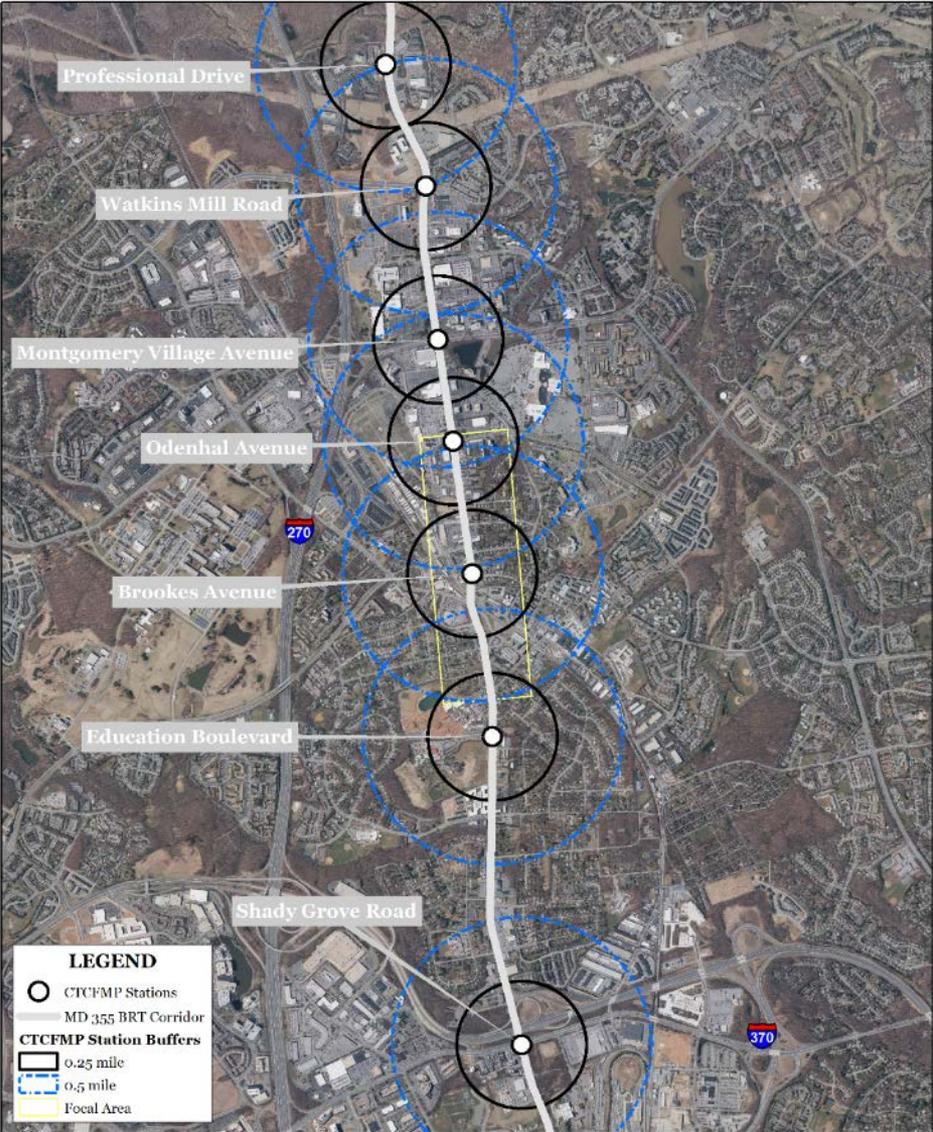


# BRT Station Locations

# Station Location Functional Considerations

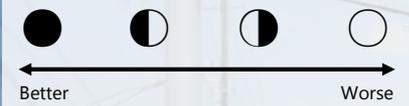
- Existing Transit Ridership
- Existing and Future Land Use
- Pedestrian, Bicycle, and Other Transportation Connections
- Traffic/Roadway Network Implications
- Stop Spacing

# CTCFMP Station Locations



## Professional Drive

- Existing Ridership ○
- Land Use ◐
- Existing Connections ◐
- Traffic Complications ●



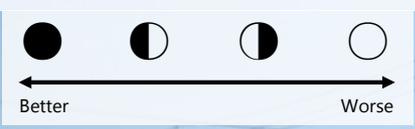
## ■ Watkins Mill Road

- Existing Ridership ●
- Land Use ●
- Existing Connections ●
- Traffic Complications ●



■ Montgomery Village Avenue (MD 124)

- Existing Ridership ○
- Land Use ◐
- Existing Connections ◐
- Traffic Complications ○



**Not favorable**

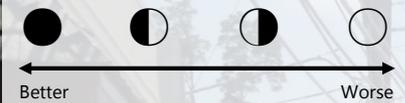
# Odendhal Avenue

- Existing Ridership ●
- Land Use ◐
- Existing Connections ◐
- Traffic Complications ◐



## ■ Brookes Avenue

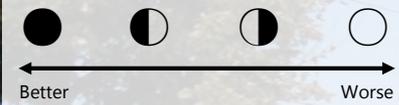
- Existing Ridership ●
- Land Use ○
- Existing Connections ○
- Traffic Complications ○



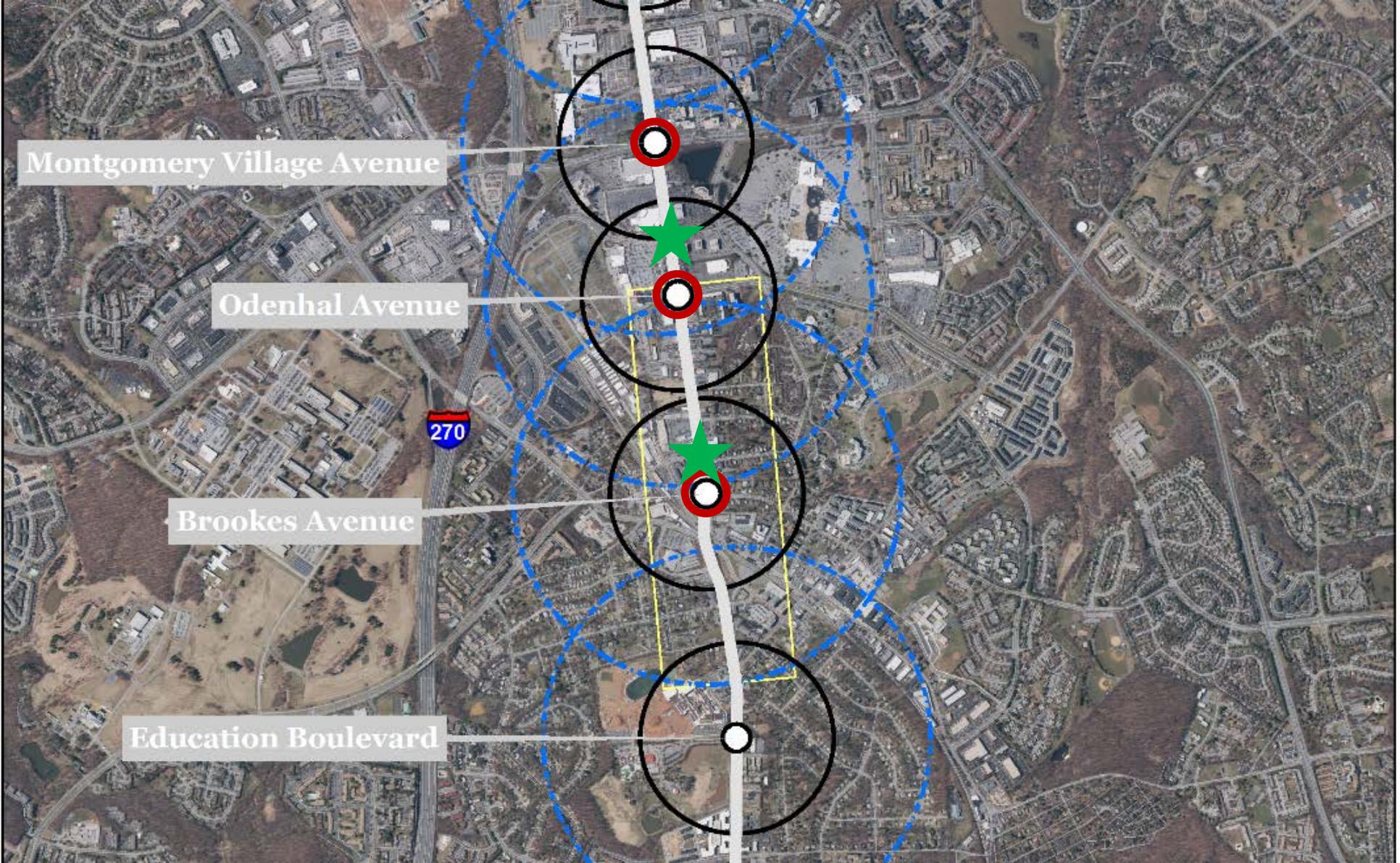
**Not favorable**

## Education Boulevard

- Existing Ridership ○
- Land Use ◐
- Existing Connections ●
- Traffic Complications ●



# Other Locations



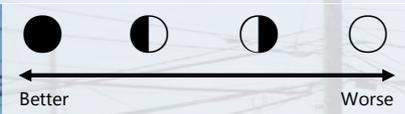
## ■ Lakeforest Boulevard

- Existing Ridership ●
- Land Use ●
- Existing Connections ◐
- Traffic Complications ◐

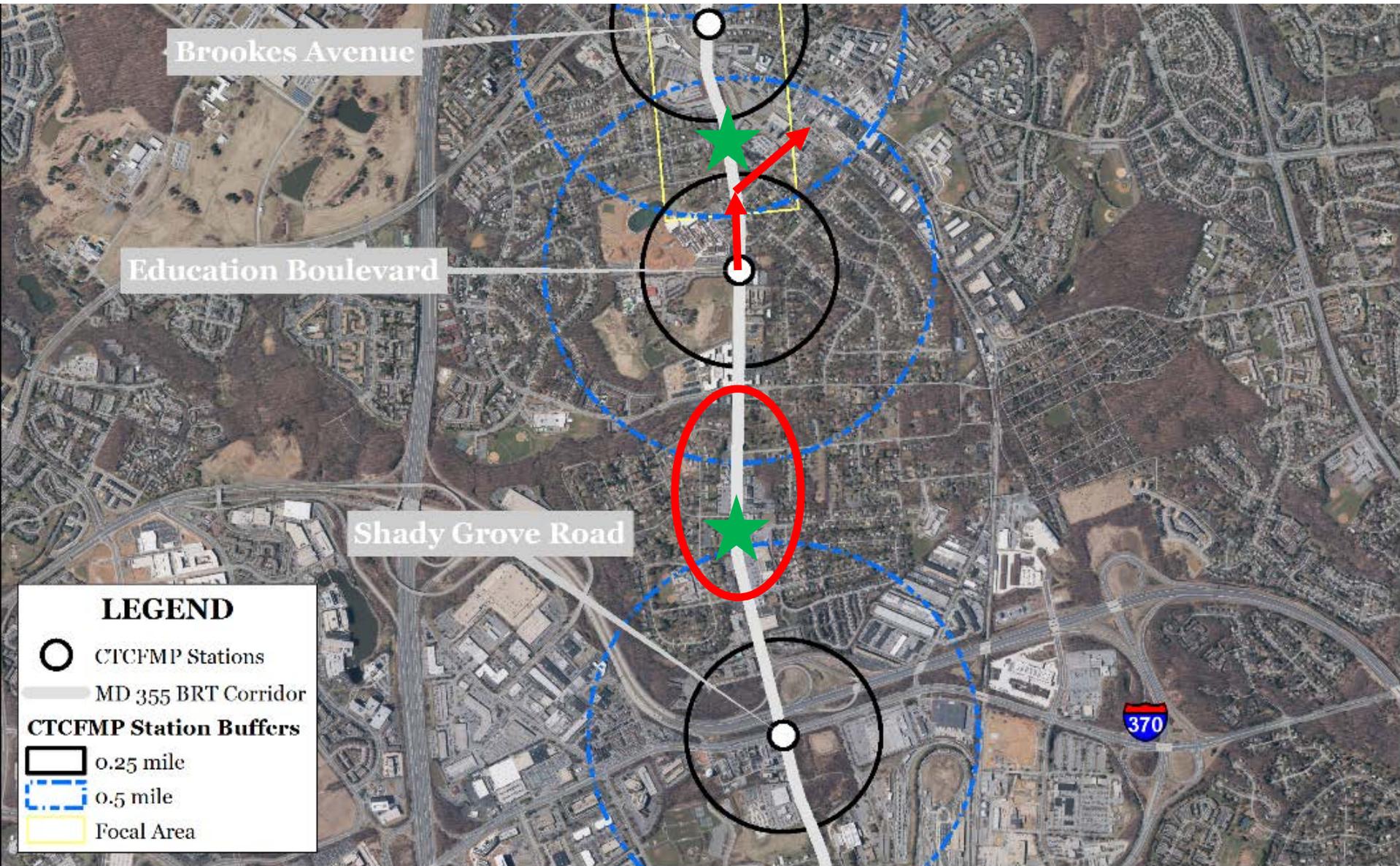


## ■ Chestnut Street/Walker Avenue

- Existing Ridership ●
- Land Use ◐
- Existing Connections ◐
- Traffic Complications ◐

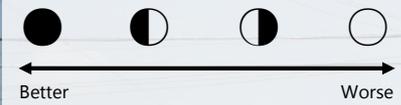


# Other Locations?



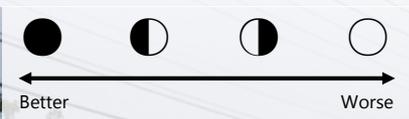
## ■ Cedar Avenue/Fulks Corner Avenue

- Existing Ridership ●
- Land Use ●
- Existing Connections ●
- Traffic Complications ●

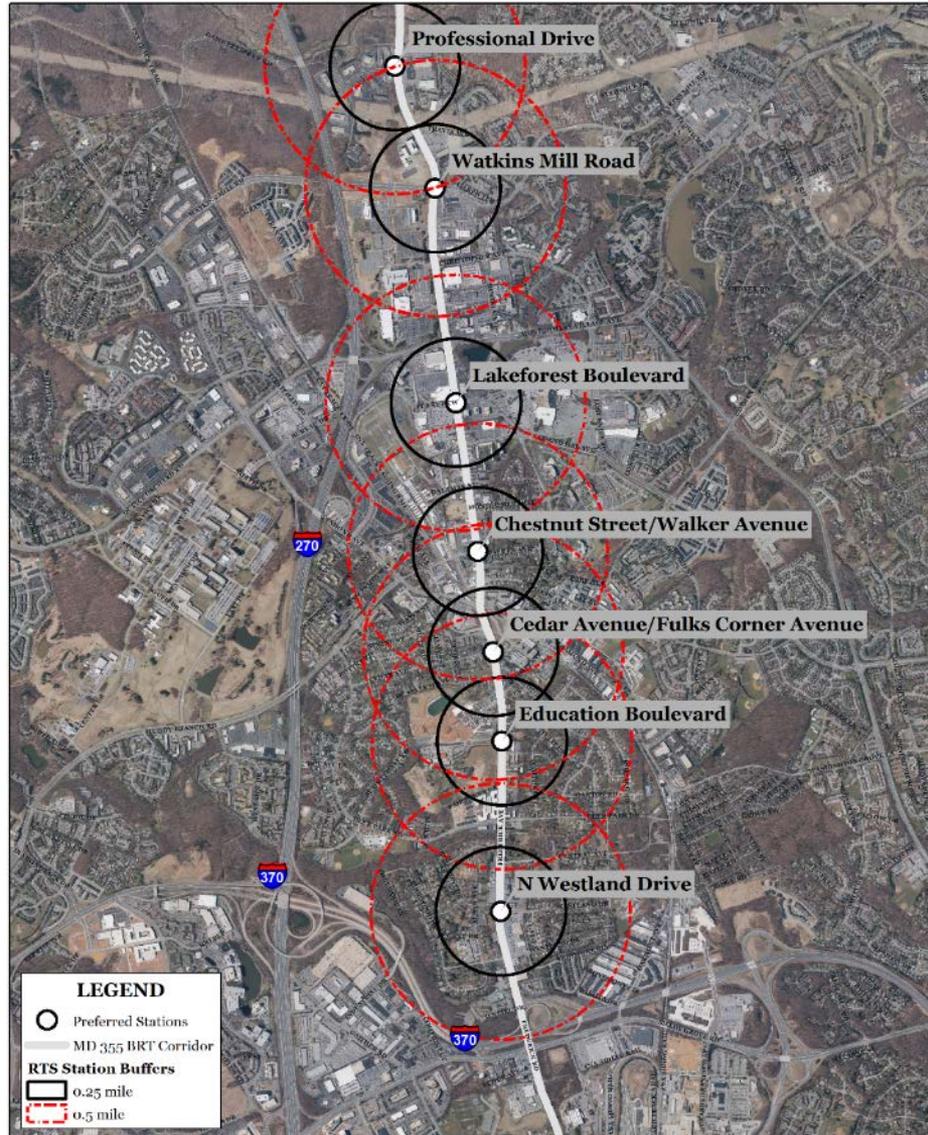


## ■ North Westland Drive

- Existing Ridership ●
- Land Use ●
- Existing Connections ●
- Traffic Complications ●



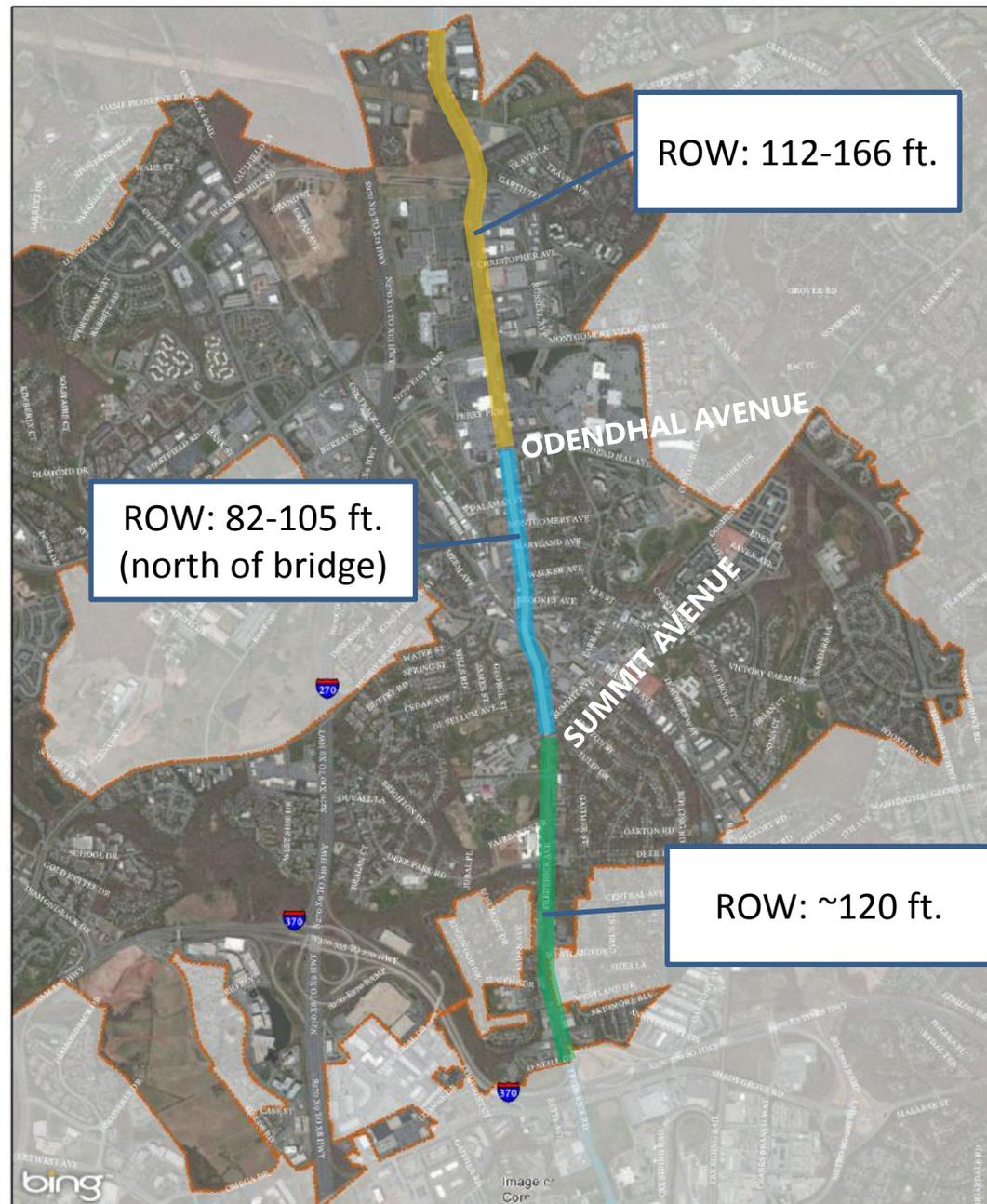
# Preferred Station Locations



# Preferred Right of Way

# Existing MD 355 Right of Way (ROW)

- North Segment
  - Widest right of way
- Focal Segment
  - Irregular property boundaries
- South Segment
  - Relatively consistent ROW



Gaithersburg BRT Corridor

**LEGEND**  
City of Gaithersburg  
Traffic Impact Focus Area



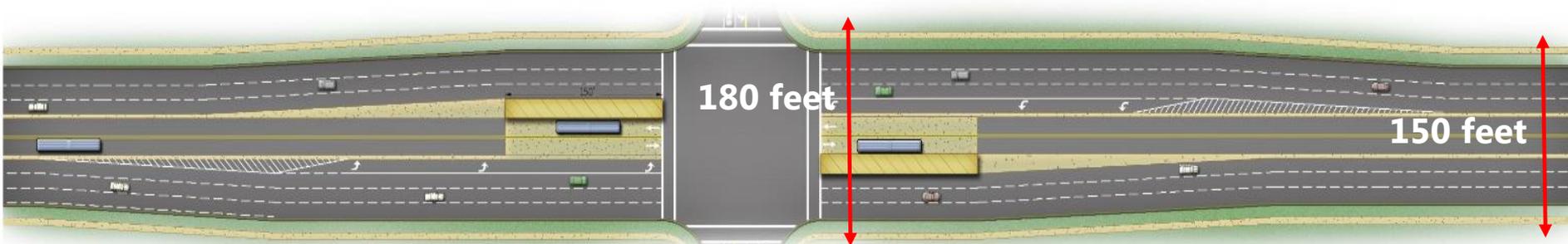
0 1,000 2,000 Feet

# Corridor & Station ROW Development

- Maryland SHA BRT Design Standards (Preferred and Minimum)

| Design Element              | Preferred Width (feet) | Minimum Width (feet) |
|-----------------------------|------------------------|----------------------|
| BRT Guideway Lanes          | 24                     | 22                   |
| BRT Median Separators       | 12                     | 4                    |
| General Traffic Lanes       | 72                     | 66                   |
| Bicycle Lanes               | 10                     | 10                   |
| Gutter Pans                 | 6                      | 6                    |
| Landscape Buffers           | 8                      | 0                    |
| Sidewalks                   | 12                     | 10                   |
| Utility/Maintenance Buffers | 4                      | 4                    |
| <b>Total Roadway Width</b>  | <b>148</b>             | <b>122</b>           |

- Property requirements are greatest at station intersections



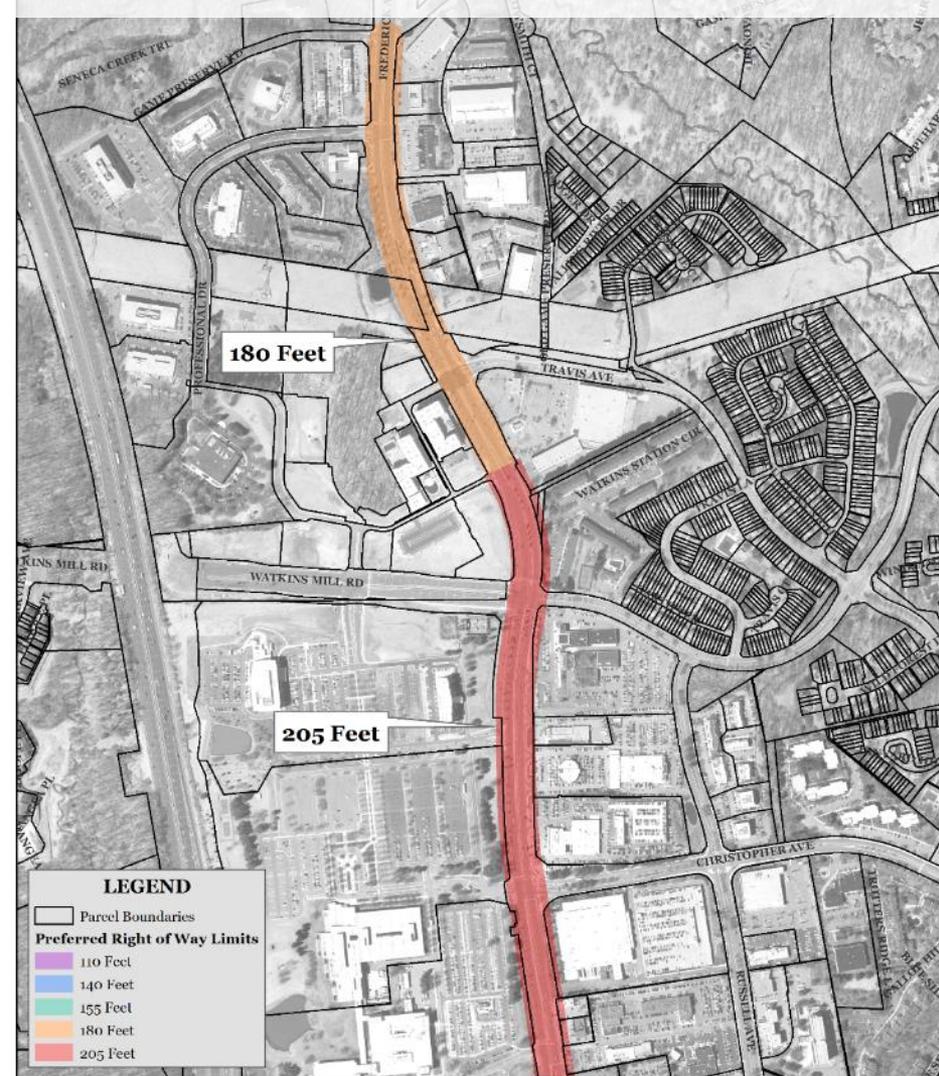
# Preferred ROW Suggestions

- Preferred ROW addresses station dimensions and focal segment hybrid alternative concept
- Focal segment ROW balances property impacts and flexibility for detailed design alignment

| MD 355 Corridor Segment Location                                     | Suggested Right of Way Width | Station Locations  |
|--|------------------------------|--|
| Game Preserve Road to Paramount Park Drive                           | 180 feet                     | Professional Drive   |
| Paramount Park Drive to 700 feet south of MD 124                     | 205 feet                     | Watkins Mill Road  |
| 700 feet south of MD 124 to Odendhal Avenue                          | 180 feet                     | Lakeforest Blvd/Perry Pkwy                                       |
| Odendhal Avenue to 200 feet north of Chestnut Street                 | 110 feet                     | n/a  |
| 200 feet north of Chestnut Street to 400 feet south of Summit Avenue | 140 feet                     | Chestnut Street/Walker Avenue & Cedar Avenue/Fulks Corner Avenue |
| 400 feet south of Summit Avenue to O’Neill Drive                     | 155 feet                     | Education Blvd & North Westland Dr                               |

# MD 355 Preferred ROW

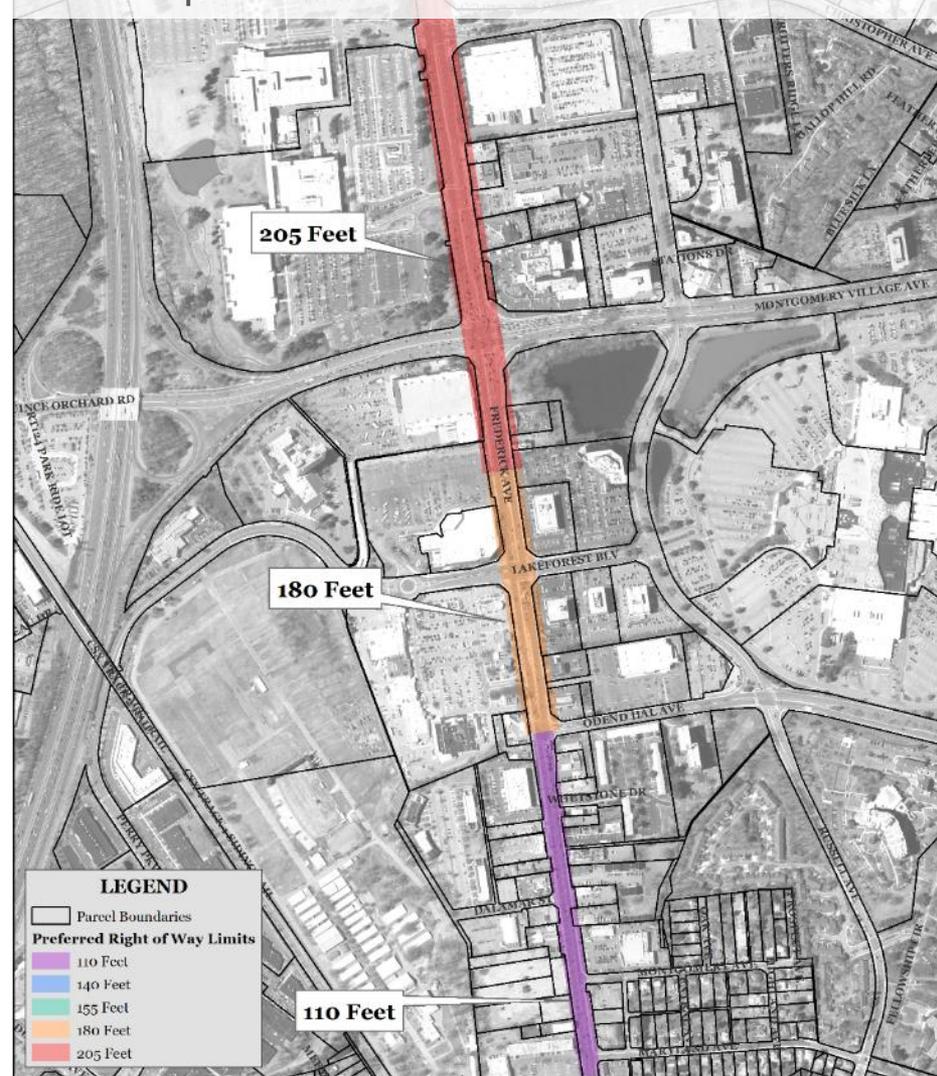
Game Preserve Road to Paramount Park Dr



Preferred Right of Way Limits - Page 1  
Gaithersburg 355 BRT Study Corridor



Christopher Avenue to Dalamar Street

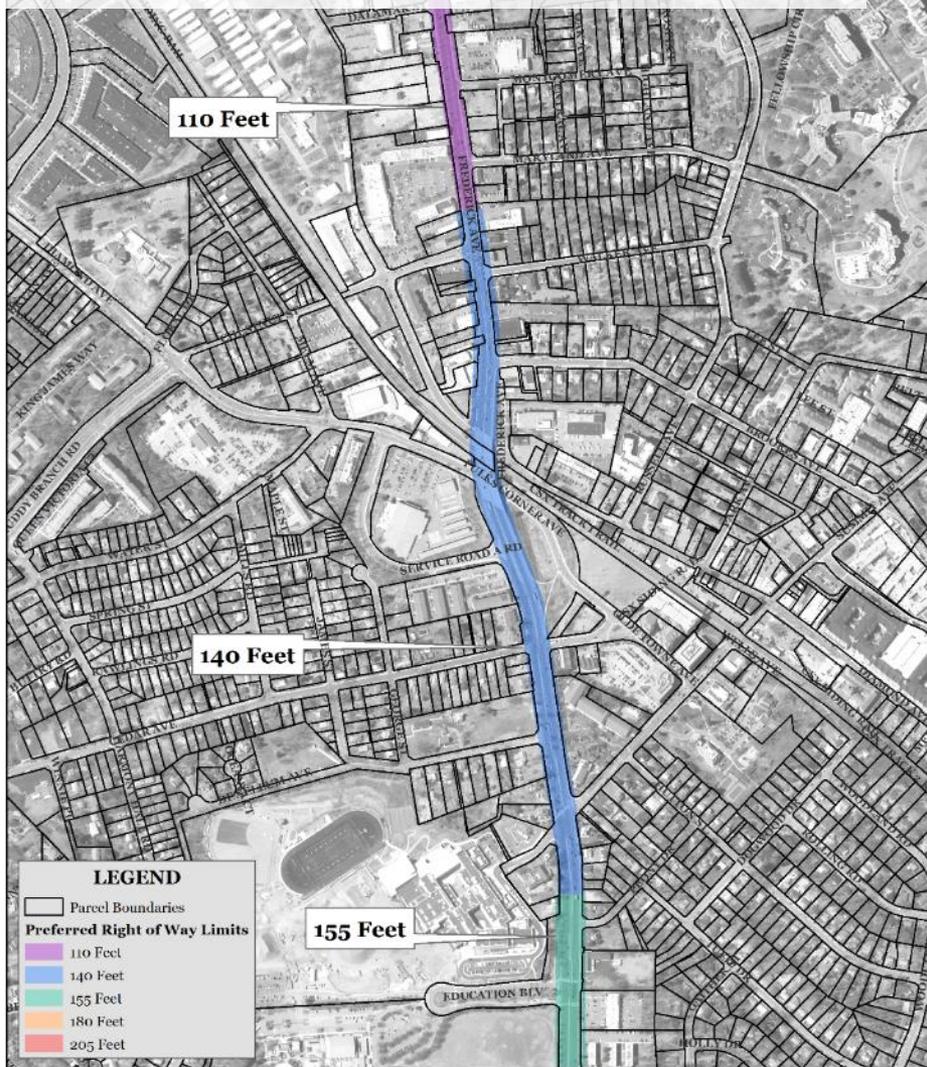


Preferred Right of Way Limits - Page 2  
Gaithersburg 355 BRT Study Corridor

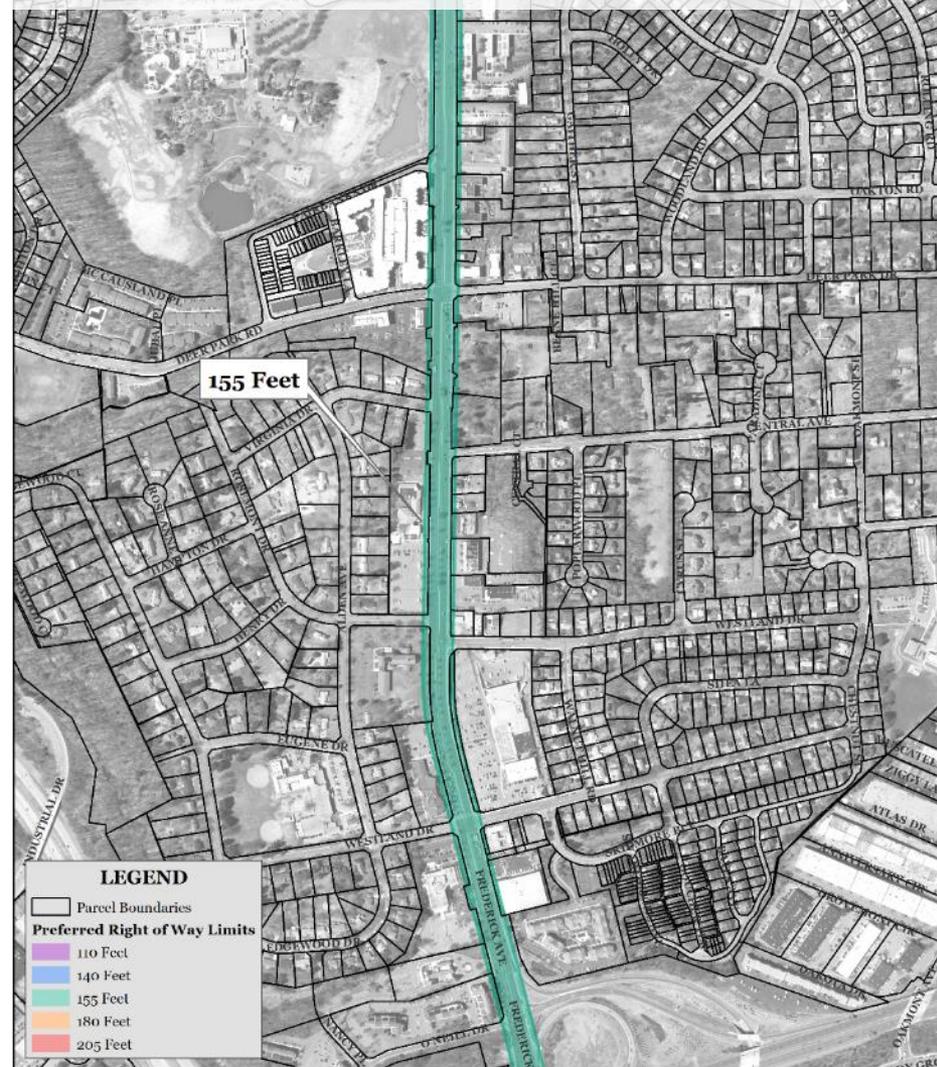


# MD 355 Preferred ROW

Dalamar Street to Education Boulevard



Education Boulevard to O'Neill Drive





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*A CHARACTER COUNTS! CITY*

Questions?

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