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DATE: June 30, 2013

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SUBJECT: Greenbelt Bus Stop Safety and Accessibility Study – Prioritization Memo

Background

In 2013 the City of Greenbelt Planning Department set out to conduct an independent inventory to assess the immediate needs for bus stop safety and accessibility with the assistance of the Washington Metropolitan Council of Governments (MWCOG) Transportation Land Use Connections (TLC) program.

About the Transportation and Land Use Connections Program

The city of Greenbelt Bus Stops Safety and Accessibility Study was funded by a grant from the Washington Metropolitan Council of Governments Transportation Planning Board. The Transportation and Land Use Connections (TLC) Program provides support to local governments in the Metropolitan Washington region as they work to improve transportation and land use coordination. Through the program, the Council of Government's Transportation Planning Board provides communities with technical assistance grants to catalyze or enhance planning efforts. TLC projects are generally targeted at a fairly small area or discrete set of issues. Lessons learned from these planning studies may then be implemented around the region. Guidance and support of this study was provided by representatives from the Metropolitan Washington Council of Governments (COG) and the City of Greenbelt.

Acknowledgements

City of Greenbelt Project Manager: Terri Hruby, Assistant Planning Director
Jamie Fearer, Community Planner

*Bus Stop Inventory: This project would not have been possible without the City of Greenbelt citizen volunteers and University of Maryland (UMD) students who took time out to receive two-hour training and self-conduct the inventory of 186 bus stops in the City of Greenbelt.

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Introduction

The project team met with the City of Greenbelt in the Fall of 2012 to discuss the objective of developing a bus stop safety and accessibility tool, a checklist, to be use by volunteers and furthermore develop a multi-year plan to implement recommendations. Before performing this task the following existing documents were reviewed:

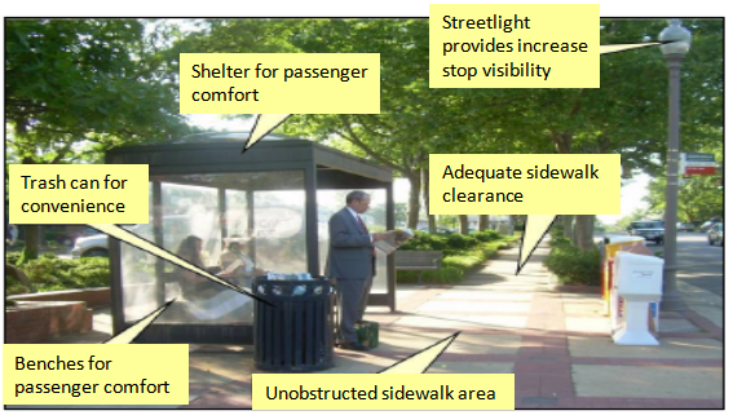
- 2010 Metropolitan Washington Regional Bus Stop Program Livability Grant Application,
- 2007 Coordinated Human Services Transportation Plan for the National Capital Region,
- 2010 Prince George's County Pedestrian to Transit Accessibility Prioritization Final Report,
- 2008 Maximizing Transit Opportunities in Greenbelt Report
- WMATA bus stop criteria
- American Public Transportation Association (APTA) and Transit Cooperative Research Program (TCRP) guideline documents for bus stop design and location

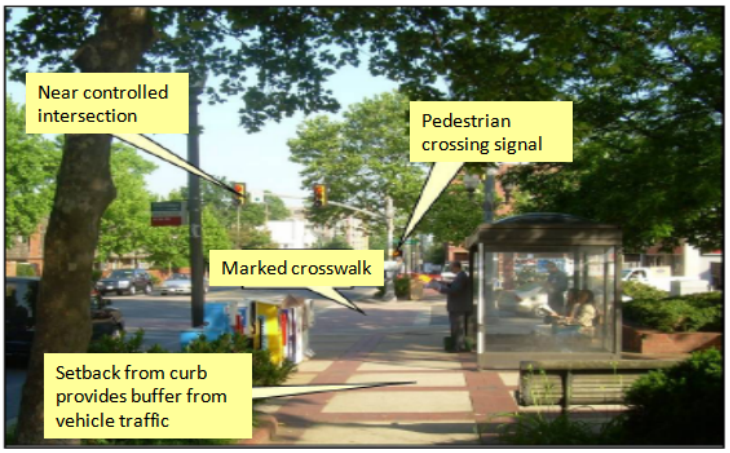
In addition, background data, where available, was collected for bus stops; transit routes; signals; lighting locations; crash data (bike/pedestrian); trail network; and land use. From the data a bus stop checklist was designed for volunteers. The checklist was designed and contained seven categories for volunteers to be trained on. After the training and the field inventory the results were compiled into this memorandum to identify priorities based on safety and accessibility.

The next section summarizes a review of the City's 191 bus stops and corresponding field evaluation checklists. The bus stops were divided into 8 geographically separated grouped areas and individually inventoried by citizens of the City of Greenbelt and UMD Students after a two-hour (2) hour training was conducted on the optimal safety and accessibility design features of a bus stop. The evaluations were conducted on Saturday's over a three-week period. A database was developed to capture all the stop characteristics in a GIS format. ESRI's ArcGIS suite was used to create the map display.

Training

On February 16, 2013 a two-hour training was conducted, and recorded, to instruct volunteers on how to be objective versus subjective while conducting an inventory. Participants (8 city residents and 6 University of Maryland students) were taught about how stops were designed and what might make pedestrian and driver behaviors positive and negative. Training illustrated the typical existing infrastructure and non-infrastructure related elements that participants might not have otherwise thought about before conducting the inventory. Participants were shown the potential elements that make up a bus stop (shown right). **Appendix A** contains a glossary of terms used in the training.





Anatomy of a bus stop:

- Bench / Shelter
- Newspaper /Trash Can
- Sidewalk / Setback
- Controlled Crossing/Lighting
- Sign

Addressing Risky behaviors:

- Education / Enforcement / Encouragement

Checklist

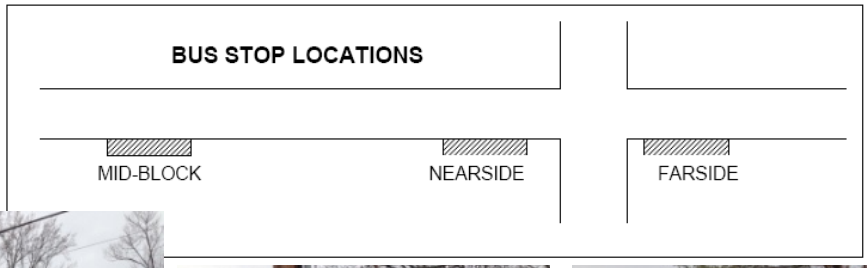
During the training and for the field inventory a checklist was provided to all participants. The field evaluation checklist included seven (7) separate categories which included:

City of Greenbelt - Bus Stop - Field Evaluation Checklist		Stop ID: Section ID:
Date of Field Survey:		
Name(s):	Agency (City, University):	
Contact Info (Phone or Email):		
Roadway Name:	Direction of Travel:	
Nearest Cross Street Name:		
Bus Routes (WMATA, The Bus, University):		
Nearby Landmarks:		

Bus Stop Elements; Roadway Elements; Traffic Engineering Elements; Pedestrian Accessibility Elements; Information Displays; Maintenance Issues; and Overall Assessment. Participants were shown each category and photographs with examples on what to look for in the field. The seven categories are illustrated below:

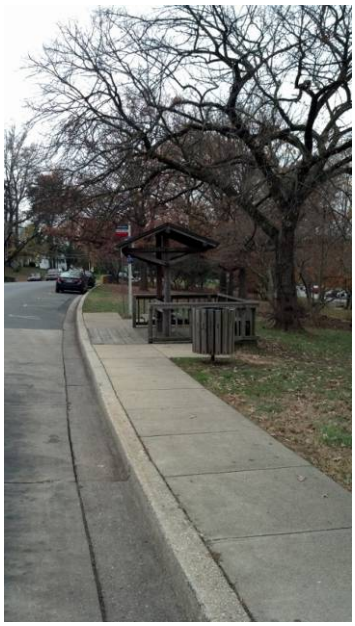
Category I – Bus Stop Elements

PARAMETERS	EVALUATION
I. **BUS STOP ELEMENTS** *Spacing, Placement*	
Relative to the nearest intersection, is the stop:	
1 ☐ Near-Side ☐ Far-Side ☐ Mid-Block	
2 Is the stop along a location with sidewalk	☐ Yes ☐ No ☐ Other/Describe
3 Is the stop along a location with a shoulder	☐ Yes ☐ No ☐ Other/Describe
4 Is the stop along a location with guardrail	☐ Yes ☐ No ☐ Other/Describe
5 Is the stop along a location with a steep slope	☐ Yes ☐ No ☐ Other/Describe
6 Is the stop spaced adequately from other stops and hazards	☐ Yes ☐ No ☐ Other/Describe



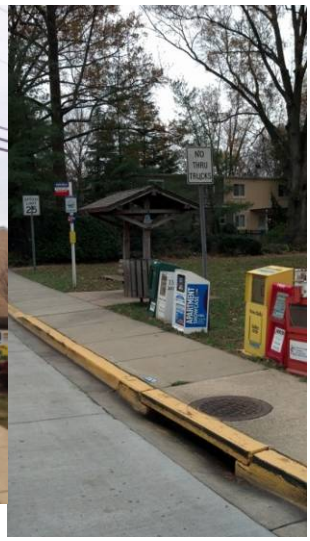
Category II – Roadway Elements

II.	ROADWAY ELEMENTS *Geometrics, Pavement Conditions, Curb Attributes*				
7	Is the roadway pavement is good condition	☐ Yes	☐ No		☐ Other/Describe
8	Is there a designated pull of area or bus pad	☐ Yes	☐ No		☐ Other/Describe
9	Is there on-street parking near the stop	☐ Yes	☐ No		☐ Other/Describe
10	*If Yes, is it blocking bus stop*	☐ Yes	☐ No		
11	Is there a curb and gutter present?	☐ Yes	☐ No		☐ Other/Describe
12	*If Yes, condition including drainage of pooled water is*	☐ Good		☐ Fair	☐ Poor



Category III – Traffic Engineering Elements

III.	TRAFFIC ENGINEERING ELEMENTS *Traffic Controls, Sight Distance, Visibility, signage, Lighting*			
	The nearest intersection is controlled by a:			
13	☐ Stop ☐ Signal ☐ None			
14	The nearest intersection has crosswalks	☐ Yes ☐ No		☐ Other/Describe
15	*If Yes, condition is*	☐ Good	☐ Fair	☐ Poor
16	The nearest intersection has pedestrian signals	☐ Yes ☐ No		☐ Other/Describe
17	Is the stop visible to passing motorists	☐ Yes ☐ No		☐ Other/Describe
18	Do pedestrians have a clear view of traffic boarding/alighting the bus	☐ Yes ☐ No		☐ Other/Describe
19	When crossing the street, do pedestrians have refuge available in a median	☐ Yes ☐ No		☐ Other/Describe
20	Are signs adequate to warn vehicles of bus and pedestrian activity	☐ Yes ☐ No		☐ Other/Describe
21	Are lighting fixtures present	☐ Yes ☐ No		☐ Other/Describe
22	*If Yes, are they functioning and bright enough*	☐ Yes ☐ No		☐ Other/Describe

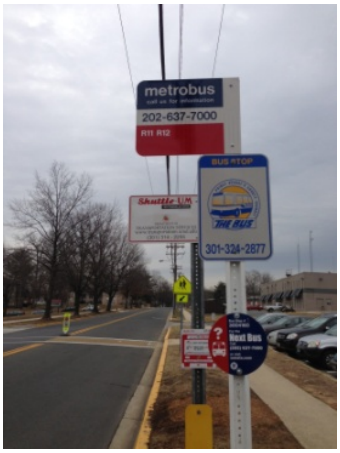


Category IV – Pedestrian Accessibility Elements

IV.	PEDESTRIAN ACCESSIBILITY ELEMENTS - ACCESS *Pedestrian Safety, Sidewalks, Crosswalks, Pedestrian Surfaces*				
23	Is there an adequate sidewalk to access the stop from each direction (4 foot wide mininum)	☐ Yes	☐ No		☐ Other/Describe
24	*If Yes, condition is*	☐ Good		☐ Fair	☐ Poor
25	At nearby driveways and intersections, is the curb cut or ramped for easy handicapped access	☐ Yes	☐ No		☐ Other/Describe
26	*If Yes, condition is*	☐ Good		☐ Fair	☐ Poor
27	*If Yes , does ramp have Detectable Warning Surface*	☐ Yes	☐ No		☐ Other/Describe
28	Is a paved and flat pedestrian landing area for loading/ unloading present	☐ Yes	☐ No		☐ Other/Describe
29	*If yes, does it meet 5 feet by 8 feet sizing?*	☐ Yes	☐ No		☐ Other/Describe
30	Is a waiting area present that does not obstruct the through sidewalk or landing area	☐ Yes	☐ No		☐ Other/Describe

Category V – Information Displays and Patron Comfort

V.	INFORMATION DISPLAYS - PATRON COMFORT - AMENITIES					
What type of traveler information is posted:						
31a	Bus stop flag identification signs?	☐ Yes	☐ No		☐ Other/Describe	
31b	Are all bus route numbers posted?	☐ Yes	☐ No		☐ Other/Describe	
31c	Are all bus schedules posted?	☐ Yes	☐ No		☐ Other/Describe	
31d	Next Bus Arrival information?	☐ Yes	☐ No		☐ Other/Describe	
32	Is seating present (e.g. bench)	☐ Yes	☐ No		☐ Other/Describe	
33	Is a shelter present	☐ Yes	☐ No		☐ Other/Describe	
34	Is a trash can present	☐ Yes	☐ No		☐ Other/Describe	
35	Is shade available at the stop	☐ Yes	☐ No		☐ Other/Describe	



Category VI – Maintenance Issues

VI.	MAINTENANCE ISSUES			
36	Is their trash, litter or graffiti present	☐ Yes	☐ No	☐ Other/Describe
37	Is there clutter or obstructions from other street furniture (e.g. newspaper boxes)	☐ Yes	☐ No	☐ Other/Describe
38	Are there obstructions from vegetations such as trees or shrubs	☐ Yes	☐ No	☐ Other/Describe
39	Are there any landscaped areas	☐ Yes	☐ No	☐ Other/Describe

Category VII – Overall Assessment

This category gave participants a chance to state whether or not they felt the stop was located in a generally safe location regardless of the actual infrastructure elements.

VII.	OVERALL ASSESSMENT			
40	Is the Bus Stop at a generally safe location?	☐ Yes	☐ No	☐ Other/Describe

Lastly, the very bottom portion of the checklist form was created for the City of Greenbelt use for further evaluation if needed.

CATEGORY (City of Greenbelt Use Only)	
☐ Category 1	The Bus Stop satisfies all the Elements in the guidelines with no additional improvement required.
☐ Category 2	The Bus Stop requires minor feasible improvements that can be accomplished with a reasonable commitment of time and resources (e.g. Pavement Markings, passenger waiting area, trimming and removal brush, etc.)
☐ Category 3	The Bus Stop requires major/further investigation/design required improvements that can only be accomplished with additional time and resources.
☐ Category 4	The Bus Stop exhibits field conditions that make required improvements impractical (e.g. additional Right-of-Way would need to be purchased for needed improvements.)
☐ Category 5	The Bus Stop fails to meet guidelines required for safety and should not be permitted. Any existing bus stop in this category should be identified for relocation, consolidation, or elimination.
CONCLUSION:	☐ Retrofit ☐ Relocation ☐ Consolidation ☐ Removal

Data Collection

The inventory took place over the month following the training and then all the completed checklist entries were entered into a database format (excel) and extracted to create an interactive GIS inventory so as to begin layering additional information and have a permanent tool for editing and updating bus stops for the City.

Inventory Summary / Prioritization

The seven categories were individually scored to determine the basic elements of transit stops based on weighted values for the needs and desires of riders at those stops. The highest weighted elements pertained to safety and access. **Figure 1** illustrates an example of the weighted categories on the field checklist that was utilized.

Figure 1. Bus Stop Evaluation Checklist Weighted Categories Example

City of Greenbelt - Bus Stop - Field Evaluation Checklist			Stop ID: Route ID:
Date of Field Survey:			
Name(s):		Agency (City, University):	
Contact Info (Phone or Email):			
Roadway Name:		Direction of Travel:	
Nearest Cross Street Name:			
Bus Routes (WMATA, The Bus, University):			
Nearby Landmarks:			
PARAMETERS	**EVALUATION**		**NOTES**
I. **BUS STOP ELEMENTS** *Spacing, Placement*			*/ 15 pts*
1 Relative to the nearest intersection, is the stop ☐ Near-Side 2.5 ☐ Far-Side 2.5 ☐ Mid-Block 1			
2 Is the stop along a location with sidewalk	☐ Yes 2.5 ☐ No 1.0	☐ Other/Describe 0.5	
3 Is the stop along a location with a shoulder	☐ Yes 2.5 ☐ No 1.0	☐ Other/Describe 0.5	
4 Is the stop along a location with guardrail	☐ Yes 2.5 ☐ No 2.0	☐ Other/Describe 0.5	
5 Is the stop along a location with a steep slope	☐ Yes 1.0 ☐ No 2.5	☐ Other/Describe 0.5	
6 Is the stop spaced adequately from other stops and hazards	☐ Yes 2.5 ☐ No 1.0	☐ Other/Describe 0.5	

Figure 2 below illustrates a map of the bus stops and their respective overall ranking to assist in detailing the priority of enhancements for all 191 bus stops in the City of Greenbelt. All of the bus stop elements were entered into the GIS database so that any of the items from the inventory checklist could be queried and given an overall score. Preliminary ranking results indicated that out of 100 possible points the breakdown of 186 (5 stops at the Greenbelt Metro Station were excluded) stops:

- 0-60 - 12 stops
- 60-70 - 35 stops
- 70-80 - 102 stops
- 80-100 - 37 stops

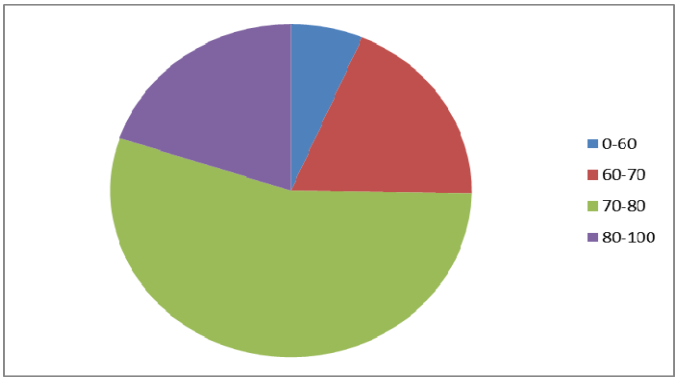


Figure 2 – Overall Bus Stop Ranking Evaluation Map

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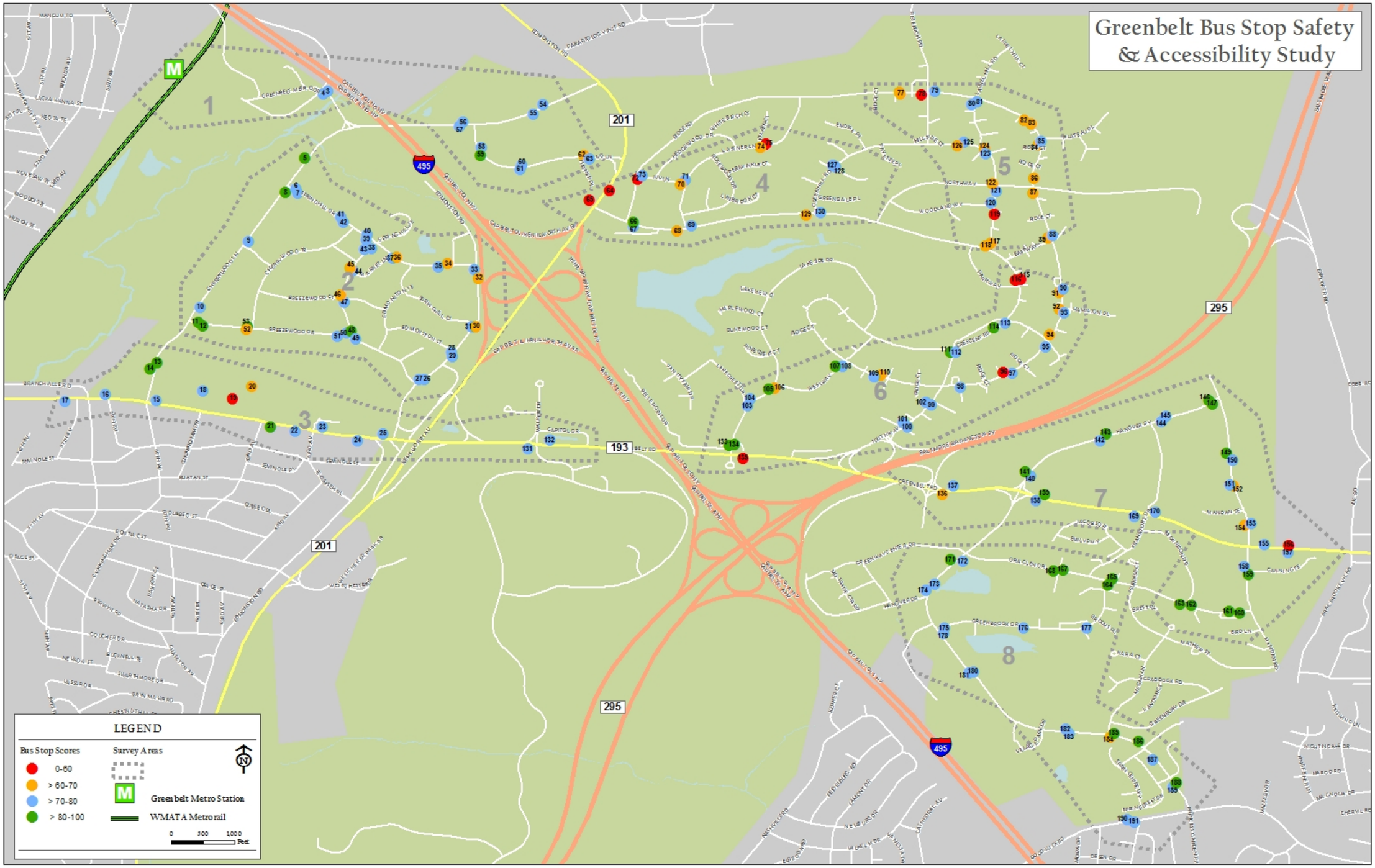

Beginning to Prioritize

The scoring for each category is based on the top priority of identifying where investments could and should occur at basic stops based on stops that ranked lowest due to an overall assessment. Looking back at the categories on those inventories first a combination of enhancements could be recommended. In general while looking at the resultant inventories we prioritize:

- Can passengers wait at the stop without being in danger?
- Are stops reasonably close to a safe street crossing location?
- Can/Should the street crossing location be improved?
- Can passengers get to the stop along reasonably safe path?

Keeping in mind WMATA has set standards for planning future enhancements we incorporated desired elements as well.

Required Feature	Basic Stop
Bus Stop Sign	Yes
ADA 5′x8′ Landing Pad	Yes
Sidewalk (access pathway)	Yes
Lighting	Evening Service
Expanded Boarding & Alighting Area (Rear-door Access)	No
Bus Bay (Pull Off)	travel speed higher than 45 mph
Shelter(s)	50+ boardings/day
Seating	Optional
Trash Receptacle	Site Specific
Information Case	50+ boardings/day
System Map	Contingent on Shelter
Real-time Display (LED + Audio)	Optional
Interactive Phone System on-site	No

The following typical elements could be recommended to enhance bus stops that scored in the following categories:

- 0-60 pts. (shelter, sidewalk connection, ramp access, lighting, passenger landing pad)
- 60-70 (adjacent parking, sight distance, poor drainage)
- 70-80 (signage, seating, trash can)
- 80-100 (little/no enhancement needed)

Typical cost estimates for those elements and enhancements are shown in **Table I,** Cost Estimates below:

Table I. City of Greenbelt Bus Stop Enhancements - Cost Estimates

Amenity	Cost per location
Bus Shelter	$3,000
Landing Pad	$1,500
Curb Cut/Ramp	$1,000
Sidewalk Connections	$3,000
Median Refuge Island	$20,000
Sign	$150
Bench	$700
Trash Can	$550
Bike Rack	$200
Electric Sign (existing power source)	$1,500
Next Bus	$4,000
Electric Service (New)	$5,500
Improved Lighting	$3,000

The 191 stops were then compared to the Existing Transit Route Maps (See Attached **MAP 1**), Crash Data (See Attached **MAP 2**), Ridership Information (See Attached **MAP 3**), Existing Pedestrian and Bicycle Network (See Attached **MAP 4**), Adjacent Traffic Controls (See Attached **MAP 5**), and Land Use Generators (See Attached **MAP 6**) to additionally support and determine where investments should occur to enhance the accessibility and access for all riders.

Recommended Improvements

In an effort to develop a methodology for recommending improvements to the stops the database and the initial mapping analysis were utilized and revealed the following key results when queried:

- 31 stops overall had shelters and 143 stops had adjacent sidewalk.
- 26 stops had accessible landing pads but of those stops 2 stops had no sidewalk or curb cuts to access them.
- Stops with sidewalk and lighting along MD 193 (Greenbelt Road) did not directly correlate to being safer stops than other stops that did not have sidewalk.
- Multiple transit routes traversed along stops that ranked well with a few stops (ten (10)) that did not were located in sections 4, 5 and 6 and were along the UMD Shuttle Route as well.
- When asked to provide an overall assessment of the stops 11 stops were identified as undesirable.

Following those 11 stops the lowest ranked stops were added to create a **"Top 25"** list to begin to further address enhancements. **Table II** displays the **"Top 25"** stops that had the lowest scores. The recommended improvements are based on returning to the evaluation forms to evaluate which category affected the score more than others and what elements in those categories could be added to enhance the overall score. **Figure 3** is a map of the **"Top 25"** stops were enhancements were needed most followed by **Figure 4, 5** and **6** for Stops without Sidewalk, Landing Pads and Curb, respectively. Some terms useful in identifying preliminary recommendations are as follows:

- Access – The path to the stop is not connected to the roadway network.

- Amenities – added features such as shelters, benches, and trash cans.
- Buffer – The stop is too close to the roadway and an adequate distance between passengers and vehicles is not available.
- Channelization – The stop needs to be separated from the adjacent travel lane in its own area.
- Drainage – The stop is in an area where water may pond and should be corrected.
- Enhance Stop Visibility – The stop is not apparent enough to passersby.
- Landing Pad – The stop would benefit from an accessible 5'x8' concrete landing pad for passengers.
- Landscaping – Maintenance of the green-space surrounding the stop should be corrected.
- Lighting – The stop would be greatly enhanced if lighting were present.
- Parking – The stop is in an area where parking may be obstructing access.
- Refuge – The stop would be more accessible if a pedestrian refuge (waiting) area was created for crossings to and from the stop.
- Remove – The stop should be considered for removal.
- Revaluate Location – The placement of the stop needs to be revaluated in the field for options such as; nearside, far-side, midblock or consolidation based on other adjacent stop locations or bus routing.
- Revaluate score / Add scores – The score for the stop categories seems lower than anticipated and should be checked.

Table II. "Top 25" Bus Stops Identified for Enhancements

#	On Street	At Street	Stop ID #	Score	Recommended Improvements
1	Greenbelt Road	Balt-Wash Parkway (MD-295) Ramp / Greenway Center	137	74.75	Buffer, Channelization, Lighting
2	Greenbelt Road	Balt-Wash Parkway (MD-295) Ramp	136	69	Landing Pad, Refuge
3	Hanover Parkway	Greenbelt Road (MD-193)	140	70.5	Revaluate location
4	Kenilworth Avenue	Crescent Road	64	50.25	Revaluate location/Remove
5	Lakeside Drive	Westway	106	66.25	Enhance stop visibility and amenities
6	Edmonston Road	Springhill Drive	32	62.25	Isolated stop; revaluate location
7	Lastner Lane	Julian Court	75	58.75	Improve Visibility of Stop
8	Crescent Road	Parkway (eastside)	115	54.5	Improve visibility an Access
9	Greenbelt Road	Lakecrest Drive	135	60	Improve Access
10	Crescent Road	Parkway	116	60	Improve visibility an Access
11	Greenbelt Road	Mandan Road	156	53.75	Revaluate Score

Table II. "Top 25" Bus Stops Identified for Enhancements - Continued					
12	Kenilworth Avenue (southbound)	Crescent Road	65	52.5	Relocate
13	Ridge Road	Research Road	78	53.5	Revaluate Score
14	Beltway Plaza	South Entrance Mall	19	57.5	Add shelter, bench, trash can
15	Ridge Road	Ivy Lane	72	58.25	Evaluate Drainage Issues
16	Ridge Road	#21 Court	96	59	Landing Pad, Evaluate Parking Revaluate Score
17	Hillside Road	#6 Court	119	59.5	Landing Pad
18	Crescent Drive	Lastner Lane	68	60.5	Evaluate Drainage, Landscaping (trimming) or relocate
19	Ivy Lane	Lastner Lane	70	60.75	Landing Pad, Sidewalk Access
20	Ridge Road	35 Court	91	61.25	Landing Pad, Sidewalk Access, Parking obstruction
21	Hanover Parkway	Megan Lane	184	62	Landing Pad
22	Ridge Road	#58 Court	83	63.5	Landing Pad
23	Hillside Road	Crescent Road	117	63.5	Landing Pad, Parking Obstruction
24	Greenhill Road	Laurel Hill Road	126	63.75	Landing Pad, Ramp
25	Ridge Road	#11	110	64.25	Landing Pad, Parking Obstruction

Figure 3 – Top 25 Bus Stop Ranking Evaluation Map

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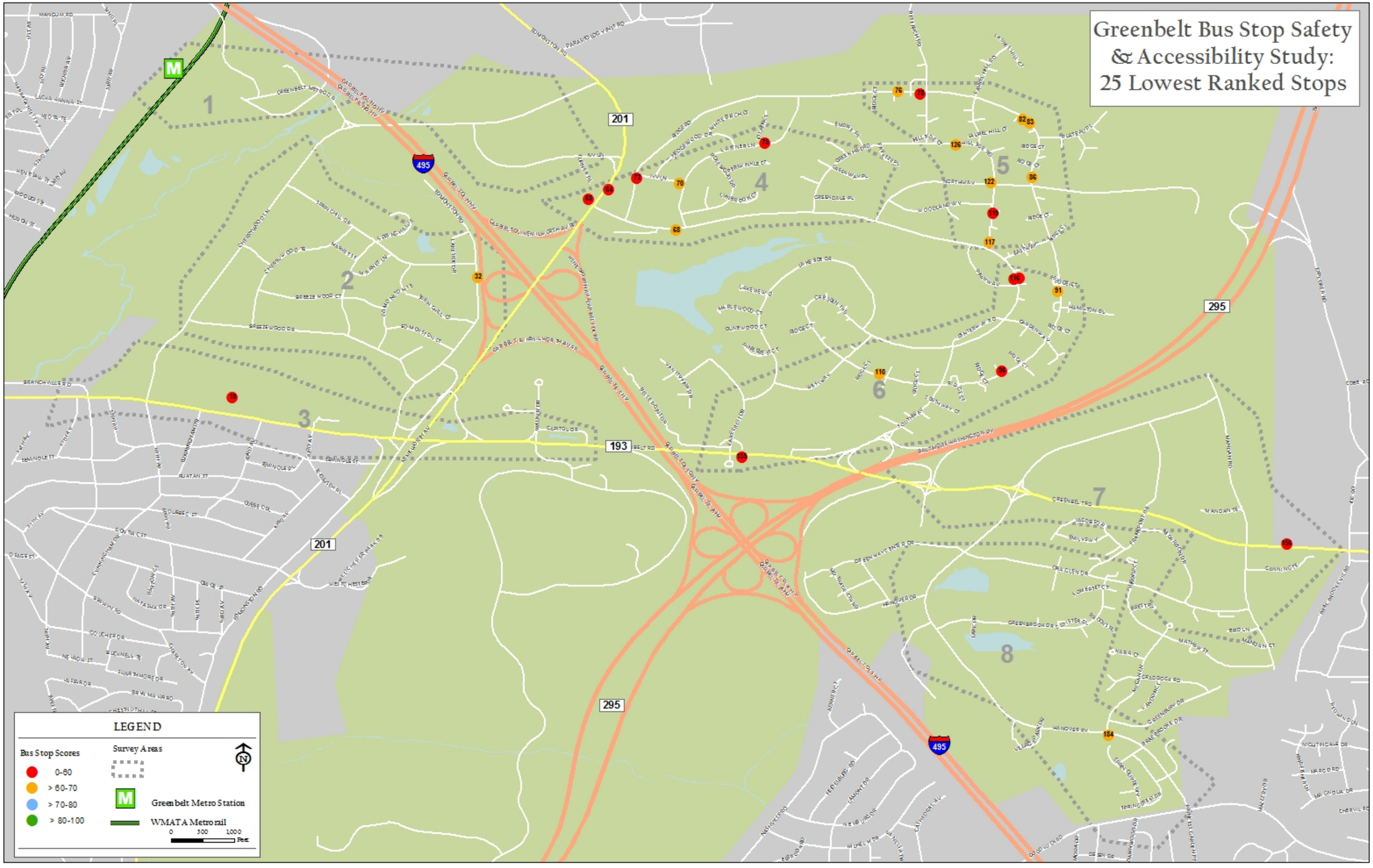

Figure 4 – Stops without Sidewalk

Figure 4 – Stops without Sidewalk

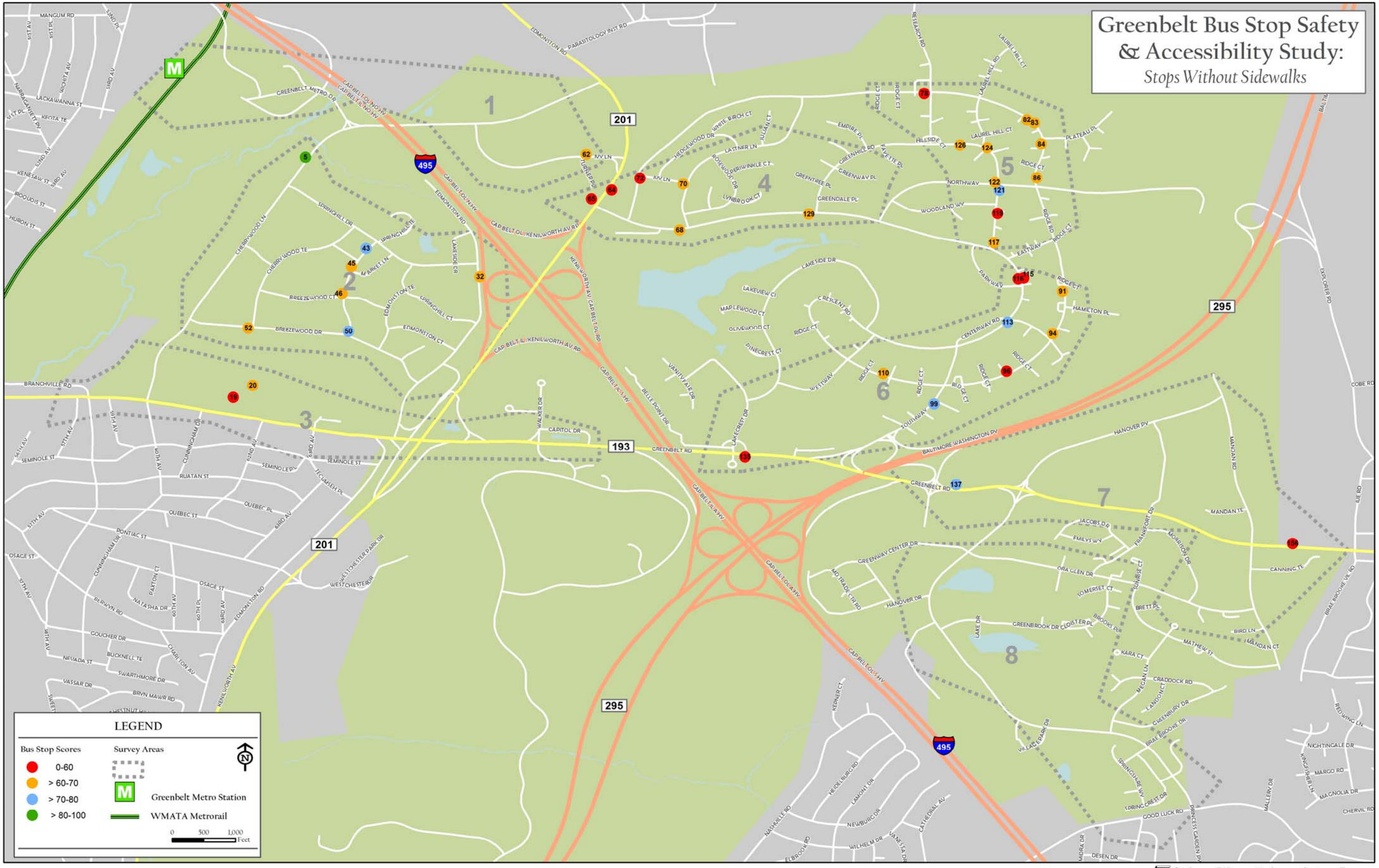

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Figure 5 – Stops without Landing Pads

Figure 5 – Stops without Landing Pads

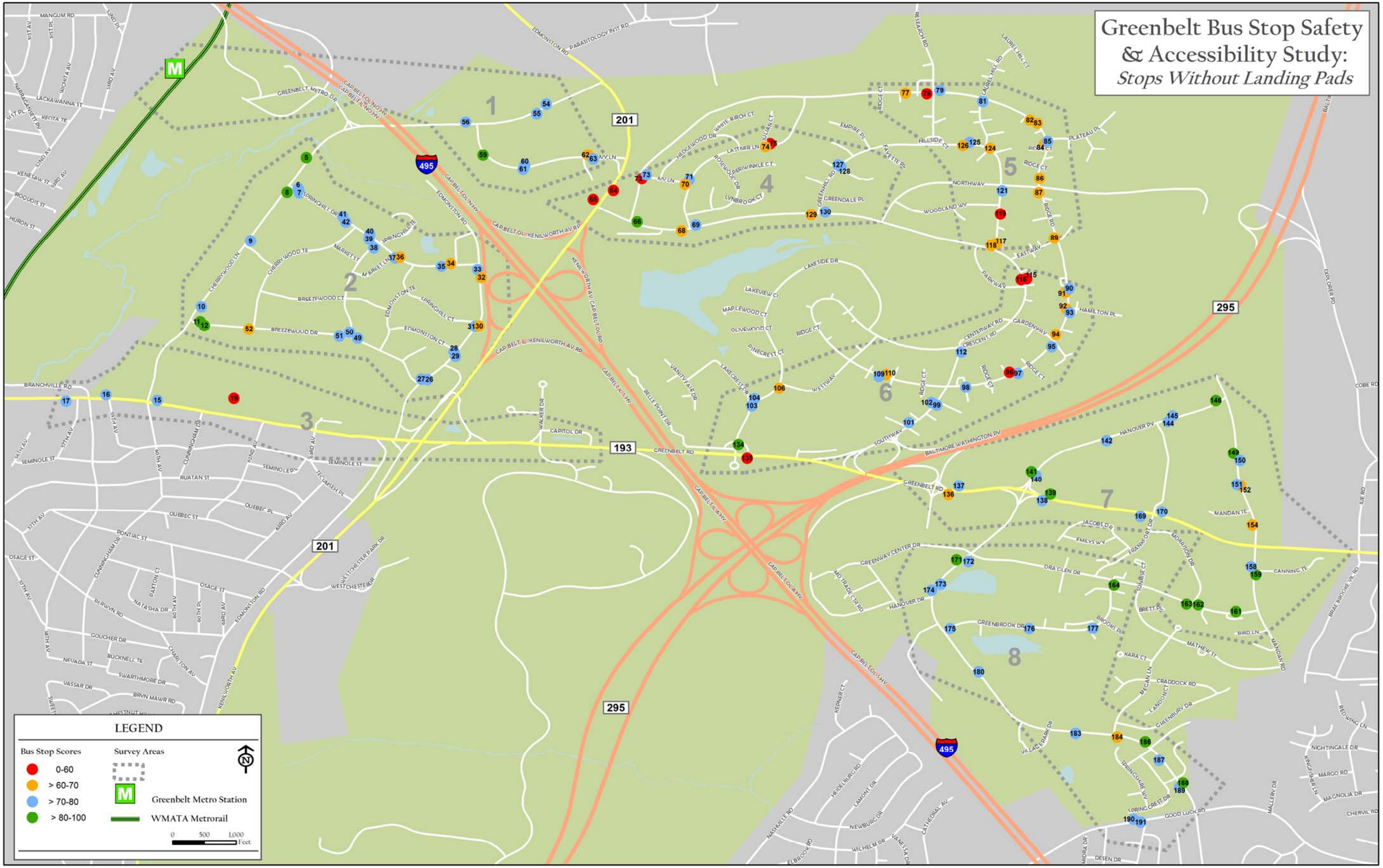
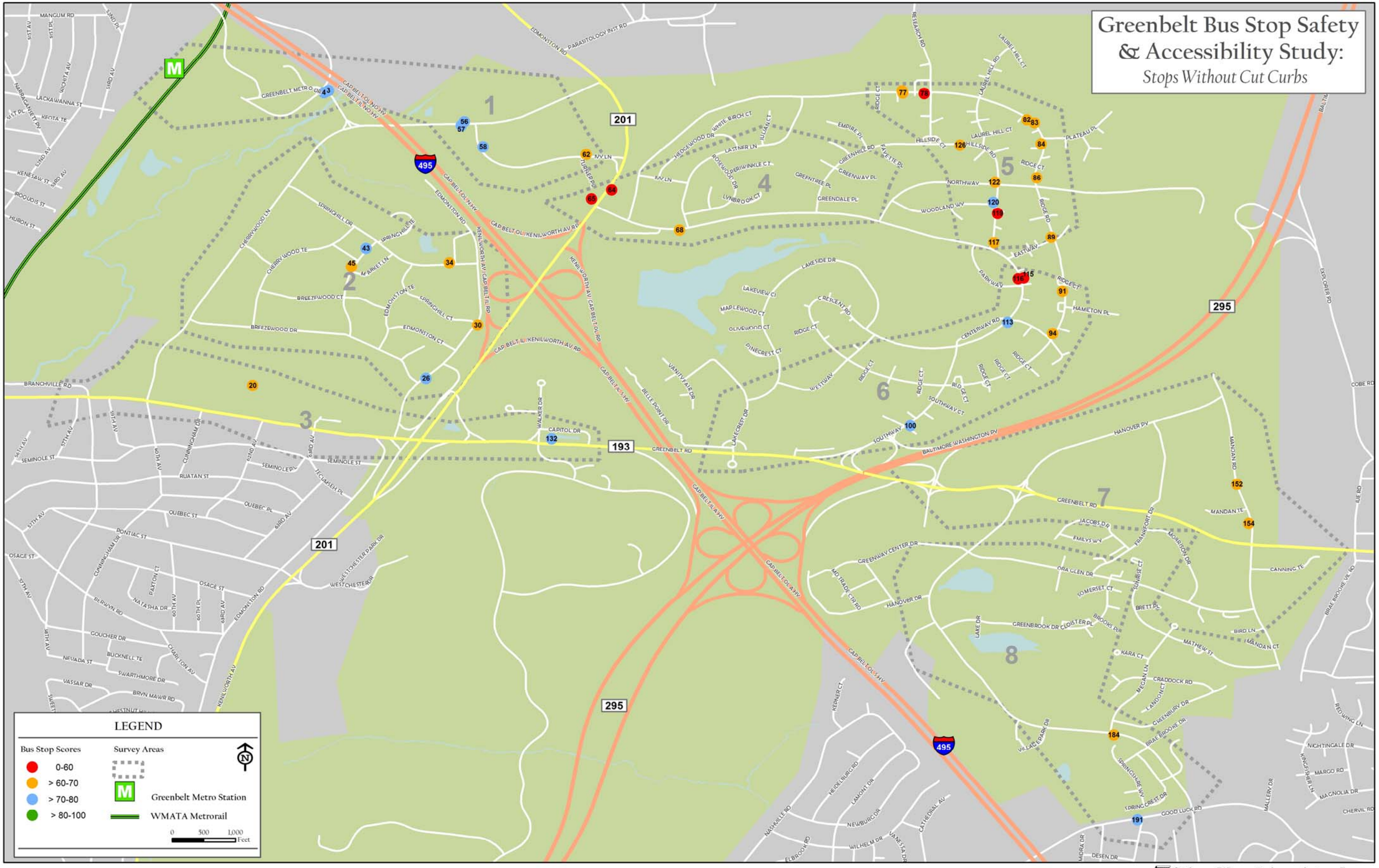


Figure 6 – Stops without Curb

Figure 6 – Stops without Curb



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At those "Top 25" stops a range of other enhancements may be identified to improve the overall score. In addition, stops that need further evaluation for their location would require accessibility. **Table 3a** below, estimates the approximate costs of the "Top 25" Bus Stop Enhancements:

Table 3a. "Top 25" Bus Stop Enhancements Estimated Costs

Enhancement	# Stops	Element Costs	Sub-Total Cost(s)
Sidewalk Connections	22	$3,000	**$66,000**
Landing Pad	22	$1,500	**$33,000**
Curb Cut/Ramp	17	$1,000	**$17,000**
		TOTAL COSTS	**$116,000**

Additionally, queries were performed on bus stop elements considered high priority, generating a list of those stops needing the following bus stop enhancements to improve their overall score. **Appendix B** contains the ranking of all the inventoried stops. The results of the query are shown in **Table 3b**, All Bus Stop Enhancements below:

Table 3b. All Bus Stop Enhancements Estimated Costs

Enhancement	# Stops	Element Costs	Sub-Total Cost(s)
Sidewalk Connections	43	$3,000	**$129,000.00**
Landing Pad	160	$1,500	**$240,000.00**
Curb Cut/Ramp	48	$1,000	**$48,000.00**
		TOTAL COSTS	**$417,000.00**

In conclusion, a significant impact to the prioritize stops could begin to be made with an initial investment at 30% of the overall potentially identified stop enhancements.

w/Attachments

Map 1 - Existing Transit Route Maps
Map 2 - Crash Data
Map 3 - Ridership Information
Map 4 - Existing Pedestrian and Bicycle Network
Map 5 - Adjacent Traffic Controls
Map 6 - Land Use Generators
Appendix A – Glossary of Terms
Appendix B – All Stops Ranking

MAP 1. Existing Transit Routes

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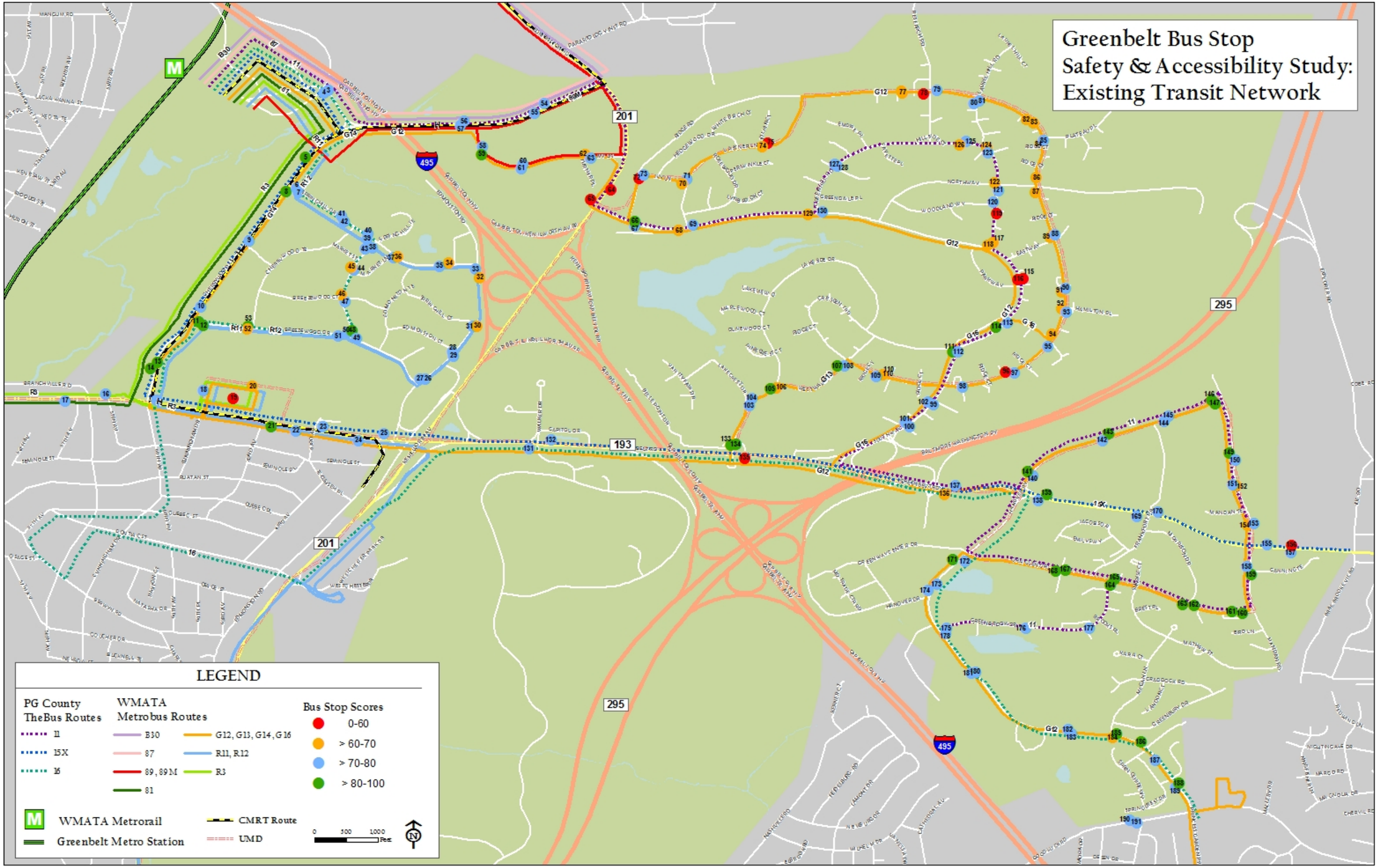
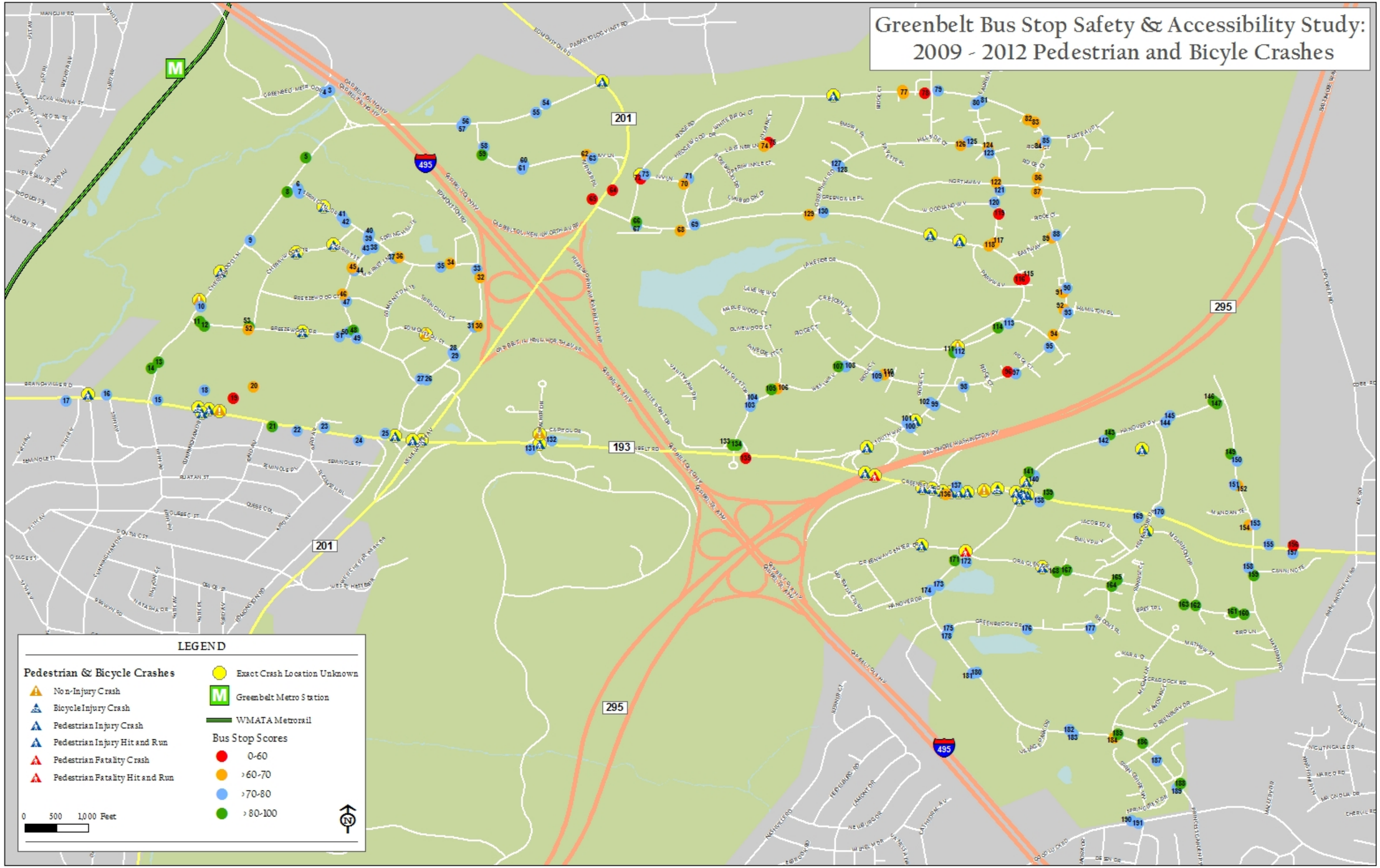


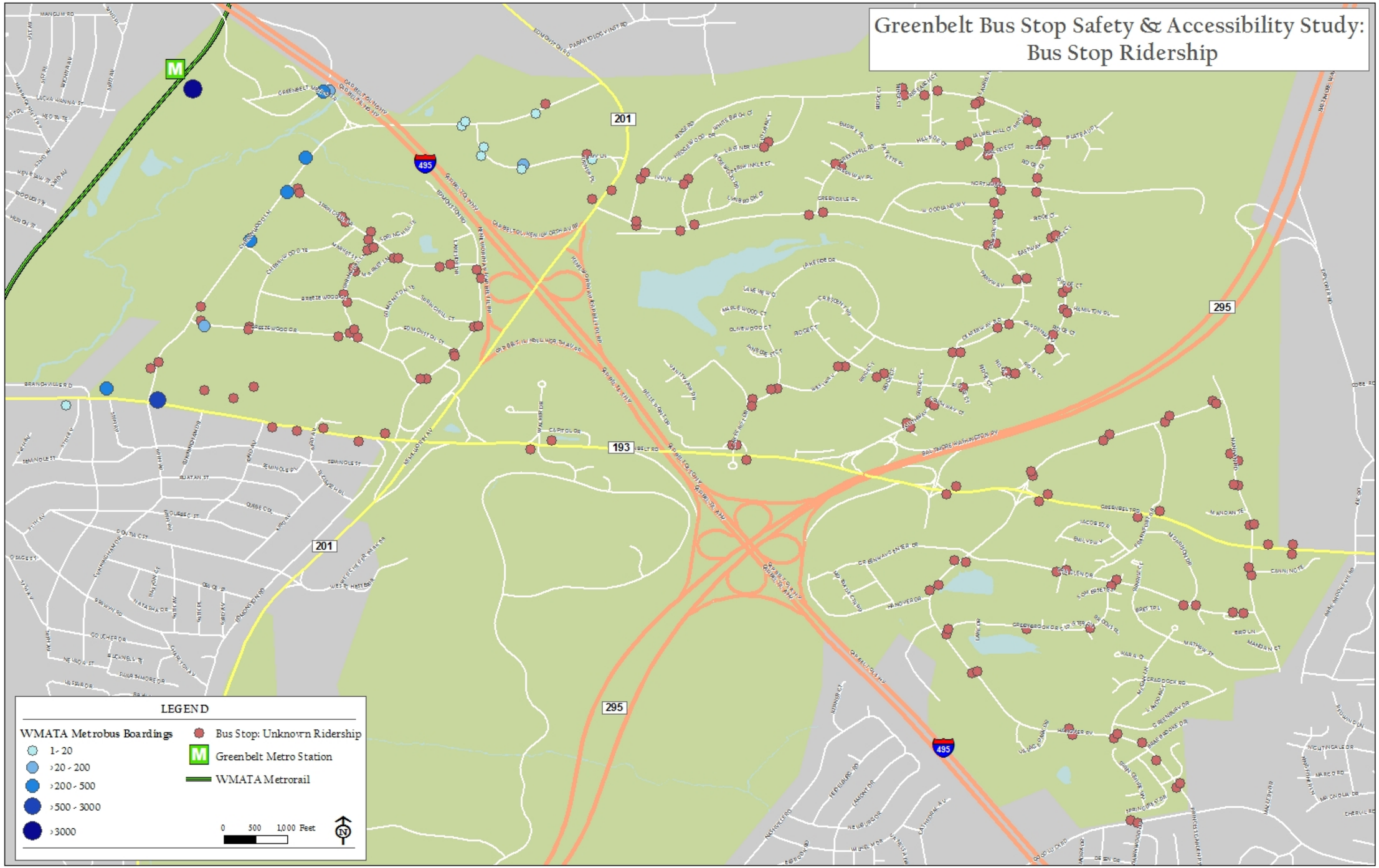
MAP 2. 2009 – 2012 Crash Data

MAP 2. 2009 – 2012 Crash Data



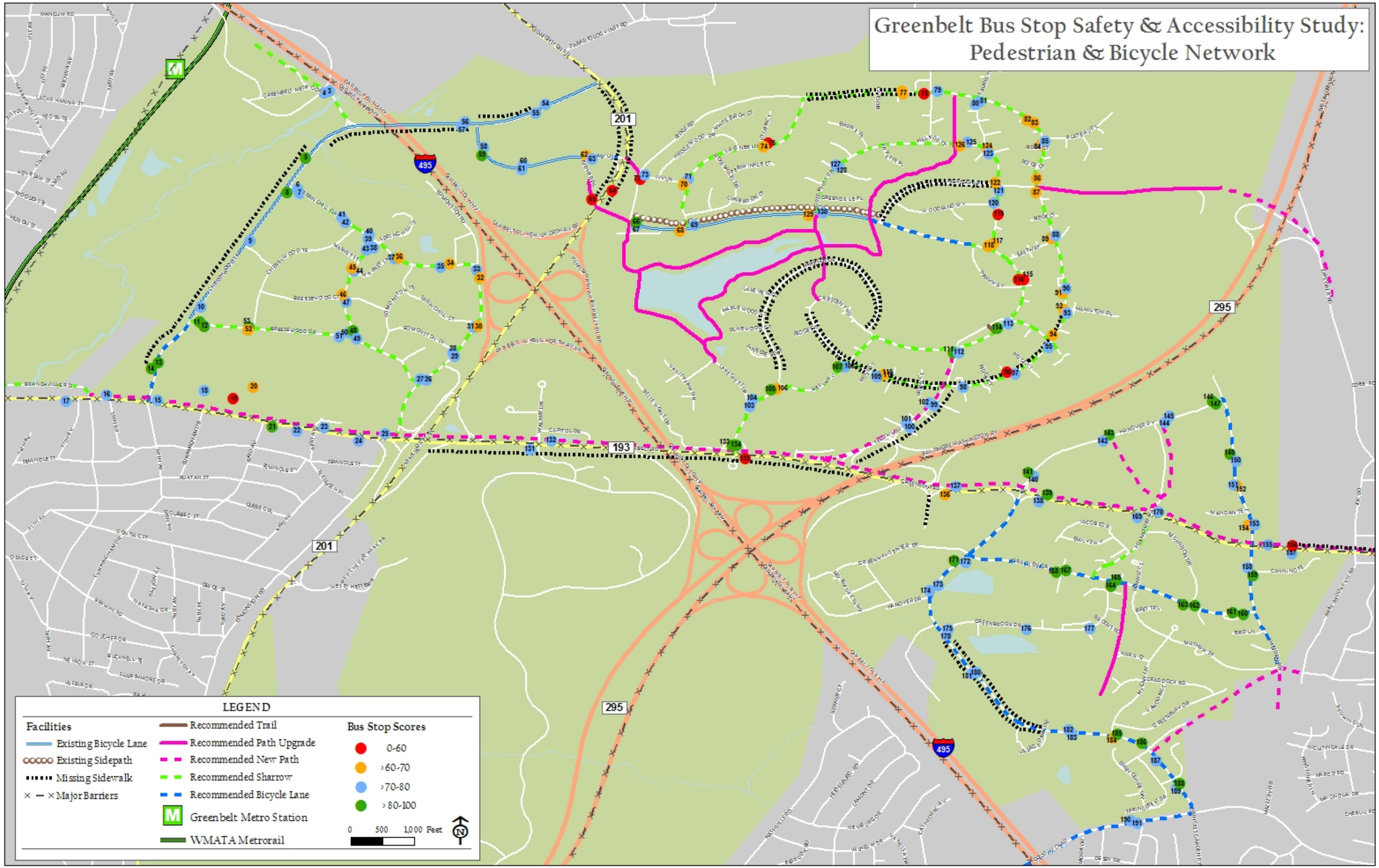
MAP 3. Ridership Data

MAP 3. Ridership Data



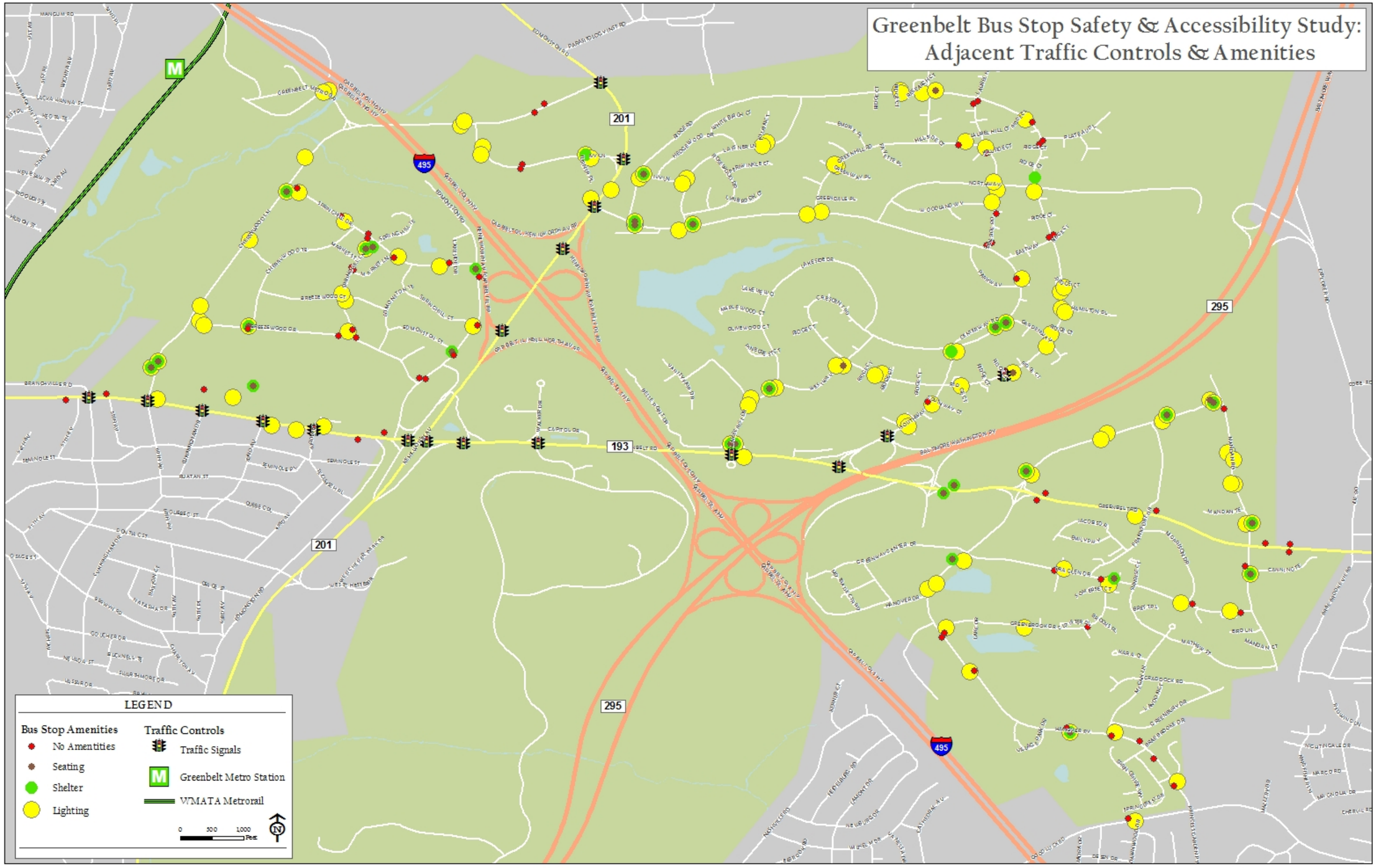
MAP 4. Existing Bicycle and Pedestrian Network

MAP 4. Existing Bicycle and Pedestrian Network



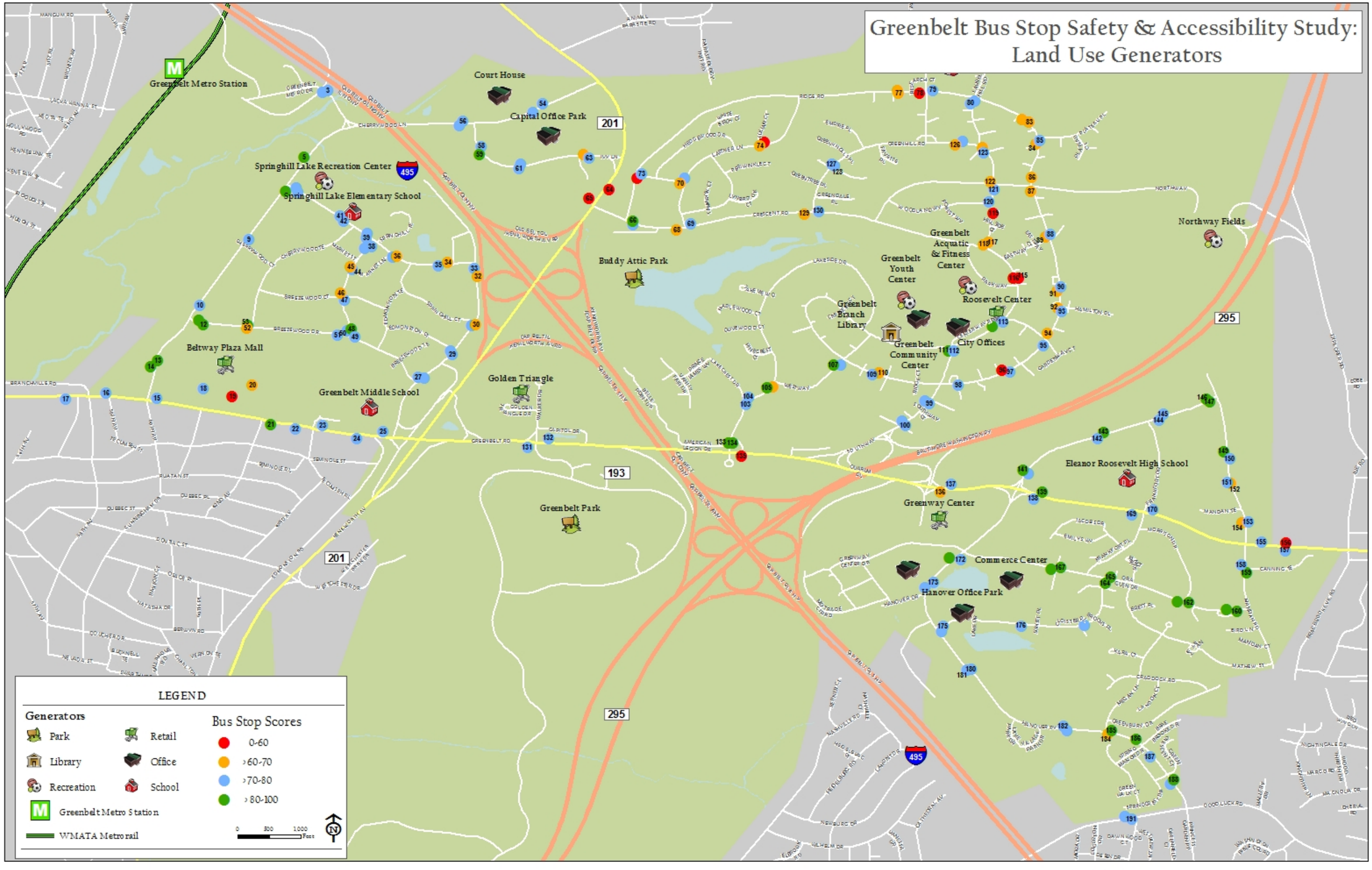
MAP 5. Adjacent Traffic Controls

MAP 5. Adjacent Traffic Controls



MAP 6. Land Use Generators

MAP 6. Land Use Generators



APPENDIX A

GLOSSARY

BUS STOP INVENTORY TERMS AND DEFINITIONS

Access way - a paved connection, preferably non-slip concrete or asphalt, that connects the bus stop waiting pad with the back face of the curb.

advertising shelter - a bus shelter that is installed by an advertising agency for the purpose of obtaining a high-visibility location for advertisements. By agreement, the bus shelter conforms to the transit agency specifications but is maintained by the advertising company.

ADA - American's with Disabilities Act of 1990. The Act supplants a patchwork of previous accessibility and barrier-free legislation with a comprehensive set of requirements and guidelines for providing *reasonable* access to and use of building, facilities, and transportation.

amenities - things that provide or increase comfort or convenience.

bollards - a concrete or metal post placed into the ground behind a bus shelter to protect the bus shelter from vehicular damage.

bus bay - an area off of the normal roadway for bus loading and unloading.

bus stop flag – a sign indicating the location of a bus stop.

bus stop spacing - the distance between consecutive stops.

bus stop zone length - the length of a roadway marked or signed as available for use by a bus loading or unloading passengers.

bus pad - an area outside of the travel lane but not in the shoulder, specifically designed for a bus to stop for loading/unloading.

curb-side factors - factors that are located off the roadway that affect patron comfort, convenience, and safety.

curb-side stop - a bus stop in the travel lane immediately adjacent to the curb.

detectable warning surface – an area of sidewalk that has raised bumps and is colored, alerting pedestrians that they have come to a road and/or crossing junction.

discontinuous sidewalk - a sidewalk that is constructed to connect the bus stop with the nearest intersection. The sidewalk does not extend beyond the bus stop.

downstream - in the direction of traffic.

dwell time - the time a bus spends at a stop, measured as the interval between its stopping and starting.

far-side stop - a bus stop located immediately after an intersection.

generator - a land use that attracts, vehicle, pedestrian, or other modes of traffic.

headway - the interval between the passing of the front ends of successive buses moving along the same lane in the same direction, usually expressed in minutes.

layover - time built into a schedule between arrivals and departures, used for the recovery of delays

and preparation for the return trip.

midblock stop - a bus stop within the block.

near-side stop - a bus stop located immediately before an intersection.

next bus arrival information – real-time information indicating when the next bus is due to arrive. May be in the form of a sign with a phone number to call.

nub - a stop where the sidewalk is extended into the parking lane, which allows the bus to pick up passengers without leaving the travel lane, also known as bus bulbs or curb extensions.

open bus bay - a bus bay designed with bay "open" to the upstream intersection.

pedestrian signal – a signal that tells pedestrians when they can cross the street and when the must wait to cross.

pull-off area – an area out of the travel lane but not in the shoulder, specifically designed for vehicles to stop for loading/unloading.

queue jumper bus bay - a bus bay designed to provide priority treatment for buses, allowing them to use right-turn lanes to bypass queued traffic at congested intersections and access a far-side open bus bay.

queue jumper lane - right-turn lane upstream of an intersection that a bus can use to bypass queue traffic at a signal.

ramped or cut curb – a curb that is open with a low-grade slope, enabling a wheelchair or handicapped pedestrian to pass onto the sidewalk.

refuge – an area in the roadway where the pedestrian can stop for refuge i.e. an island or median.

roadway geometry - the proportioning of the physical elements of a roadway, such as vertical and horizontal curves, lane widths, cross sections, and bus bays.

shelter - a curb-side amenity designed to provide protection and relief from the elements and a place to sit while patrons wait for the bus.

shoulder – paved area lying outside of the road travel lanes.

steep slope – an area of sidewalk that is steep, prohibiting or making travel difficult for some pedestrians. (e.g. elderly, or pedestrian in wheelchair).

street-side factors - factors associated with the roadway that influence bus operation

The Bus - the bus line own and operated by Prince George's County, Maryland.

upstream - toward the source of traffic.

University – the bus line owned and operated by the University of Maryland College Park.

waiting or accessory pad - a paved area that is provided for bus patrons and may contain a bench or shelter

WMATA - the acronym for the Washington Metropolitan Area Transit Authority. WMATA operates the metrorail subway and bus lines in Washington DC and adjacent counties in Maryland and Northern Virginia.

APPENDIX B

City of Greenbelt Bus Stop Ranking

On Street	At Street	Stop ID #	Score	Recommendations
BREEZEWOOD DR	CHERRYWOOD TERR	53	89.25	
CHERRYWOOD LN	#5510	13	87.5	
LAKECREST DR	AMERICAN LEGION DR	133	87.25	
HANOVER PKWY	GOOD LUCK RD	188	86.25	
RIDGE RD	CRESCENT RD	111	86	
CHERRYWOOD LN	SPRINGHILL DR	8	86	
HANOVER PKWY	MANDAN RD	147	85.75	
HANOVER PKWY	GREENWAY CENTER DR	171	85.75	
HANOVER PKWY	MEGAN LN	185	85.5	
ORA GLEN DR	ORA CT	167	84.75	
GREENBROOK DR	ORA GLEN DR	164	84.5	
HANOVER PKWY	#7722	143	84	
LAKECREST DR	LAKECREST CIR	134	83.25	
ORA GLEN DR	WINTERGREEN CT	165	83	
MANDAN RD	CANNING TERR	159	82.5	
ORA GLEN DR	SOUTH ORA CT	168	82.5	
HANOVER PKWY	MANDAN RD	146	82.25	
CRESCENT RD	GARDENWAY	114	82.25	
GREENBELT ROAD	62ND AVENUE	21	82.25	
ORA GLEN DR	MANDAN RD	160	81.75	
HANOVER PKWY	SPRING MANOR DR	186	81.5	
LAKESIDE DR	WESTWAY	105	81.5	
SPRINGHILL LN	BREEZEWOOD DR	48	81.5	
BREEZEWOOD DR	CHERRYWOOD LN	11	81.25	
BREEZEWOOD DR	CHERRYWOOD LN	12	81.25	
ORA GLEN DR	MORRISON DR	162	81	
ORA GLEN DR	MANDAN RD	161	81	
MANDAN RD	MANDAN RD	149	81	
HANOVER PKWY	GREENBELT RD (MD-193)	141	81	
IVY LN	#6303	59	81	
CHERRYWOOD LN	#5510	14	80.75	
ORA GLEN DR	MORRISON DR	163	80.25	
CRESCENT RD	RIDGE RD	66	80.25	

City of Greenbelt Bus Stop Ranking

On Street	At Street	Stop ID #	Score	Recommendations
WESTWAY	RIDGE RD	107	80.25	
CHERRYWOOD LN	MID BLOCK	5	80.25	
GREENBELT RD	HANOVER PKWY	139	80.25	
MANDAN RD	CANNING TERR	158	80	
MANDAN RD	GREENBELT RD	153	79.75	
GREENBELT RD	MANDAN RD	155	79.75	
HANOVER PKWY	GREEN CRESCENT CT	189	79.75	
RIDGE RD	RESEARCH RD	79	79.75	
HANOVER PKWY	VILLAGE PARK DR	183	79.5	
HANOVER PKWY	ORA GLEN DR	172	79.5	
LAKECREST DR	LAKESIDE DR	103	79.5	
RIDGE RD	#22	97	79.5	
HANOVER PKWY	SPRING MANOR DR	187	79	
WESTWAY	RIDGE RD	108	78.75	
GOOD LUCK RD	DAWNWOOD DR	190	78.5	
SPRINGHILL LN	MARKET LN	44	78.5	
EDMONSTON RD	SPRINGHILL DR	33	78.5	
RIDGE RD	GARDENWAY	95	78.5	
CHERRYWOOD LN	MID BLOCK	10	78.5	
HANOVER PKWY	MEGAN LN	182	78.25	
GREENBELT RD	HANOVER PKWY	138	78.25	
MANDAN RD	MANDAN RD	151	78	
MANDAN RD	MANDAN RD	150	77.75	
GREENBROOK DR	HANOVER PKWY	175	77.75	
SPRINGHILL DR	SPRINGHILL LN	39	77.75	
CHERRYWOOD LN	CHERRYWOOD CT	9	77.75	
HANOVER PKWY	#7800	145	77.5	
GREENBELT METRO DR	CHERRYWOOD LN	4	77.5	
HILLSIDE RD	RIDGE RD	80	77.5	
EDMONSTON RD	EDMONSTON CT	28	77.5	
BREEZEWOOD DR	SPRINGHIILL LN	51	77.5	
GREENHILL ROAD	LAUREL HILL RD	125	77.5	
GREENBELT RD	MANDAN RD	157	77.25	

City of Greenbelt Bus Stop Ranking

On Street	At Street	Stop ID #	Score	Recommendations
LAKESIDE DR	LAKECREST DR	104	77.25	
GREENBELT RD	CHERRYWOOD LN	15	77.25	
GREENBELT RD	FRANKFORT DR	169	77.25	
IVY LN	#6404-6406	60	77	
GREENBELT RD	WALKER DR	131	77	
EDMONSTON RD	BREEZEWOOD DR	27	77	
HANOVER PKWY	GREENBROOK DR	178	76.75	
CHERRYWOOD LN	US COURTHOUSE	54	76.75	
RIDGE RD	#38 CT	90	76.5	
GREENBELT METRO DR	CHERRYWOOD LN	3	76.25	
HANOVER PKWY	#7722	142	76.25	
SPRINGHILL DR	LAKESIDE DR	35	76.25	
CRESCENT RD	RIDGE RD	67	76	
SPRINGHILL LN	SPRINGHILL RD	38	76	
HILLSIDE RD	13 HILLSIDE	123	75.75	
CHERRYWOOD LN	US COURTHOUSE	55	75.75	
SPRINGHILL DR	SPRINGHILL LAKE ELEM	42	75.75	
GREENBELT RD	EDMONSTON RD	25	75.75	
IVY LN	KENILWORTH AVE	63	75.75	
CRESCENT RD	GREENHILL RD	130	75.75	
RIDGE RD	EASTWAY	88	75.5	
CRESCENT RD	LASTNER LN	69	75.5	
GREENBELT RD	63RD AVE	23	75.25	
SPRINGHILL LN	BREEZEWOOD DR	50	75	
GREENBELT RD	BALT-WASH PKWY (MD-295) RAMP / GREEN	137	74.75	
LAUREL HILL RD	RIIDGE RD	81	74.75	
IVY LN	#6301	58	74.75	
GREENBELT RD	59TH AVE	16	74.75	
HANOVER PKWY	HUNTINGTON RIDGE	180	74.5	
GREENBELT RD	FRANKFORT DR	170	74.5	
GREENHILL RD	ORANGE CT	127	74.5	
HANOVER PKWY	HUNTINGTON RIDGE	181	74.25	
SPRINGHILL DR	SPRINGHILL LAKE ELEM	41	74.25	

City of Greenbelt Bus Stop Ranking

On Street	At Street	Stop ID #	Score	Recommendations
LASTNER LN	IVY LN	71	74.25	
HANOVER PKWY	#7800	144	74	
RIDGE RD	PLATEAU PL	85	74	
CRESCENT RD	GARDENWAY	113	74	
EDMONSTON RD	EDMONSTON CT	29	74	
GREENBELT RD	EDMONSTON RD	24	73.5	
SPRINGHILL DR	CHERRYWOOD LN	7	73.5	
HILLSIDE RD	NORTHWAY	121	73.25	
RIDGE RD	HAMILTON PL	93	73.25	
CHERRYWOOD LN	IVY LN	57	73.25	
SPRINGHILL LN	SPRINGHILL RD	43	73.25	
RIDGE RD	#12 CT	109	73	
IVY LN	#6400	61	73	
EDMONSTON RD	SPRINGHILL CT	31	73	
BREEZEWOOD DR	SPRINGHIILL LN	49	72.75	
HANOVER PKWY	HANOVER DR	173	72.5	
SOUTHWAY RD	RIDGE RD	99	72.5	
SPRINGHILL LN	BREEZEWOOD CT	47	72.5	
EDMONSTON RD	BREEZEWOOD DR	26	72.5	
BELTWAY PLAZA	#6230 (CUNNINGHAM DR EXIT)	18	72.5	
HANOVER PKWY	HANOVER DR	174	72.25	
SOUTHWAY RD	CRESCENT RD	112	72.25	
GREENBROOK DR	#7623	176	72	
GOOD LUCK RD	DAWNWOOD DR	191	72	
SOUTHWAY RD	#10	101	72	
HILLSIDE RD	WOODLAND WAY	120	71.75	
GREENBELT RD	GREENBELT PARK	132	71.75	
SOUTHWAY RD	RIDGE RD	102	71.5	
SPRINGHILL DR	MARKET LN	37	71.5	
GREENBELT RD	57th	17	71.5	
RIDGE RD	SOUTHWAY	98	71.25	
SPRINGHILL DR	CHERRYWOOD TERR	40	71.25	
GREENHILL RD	GREENWAY PL	128	71.25	

City of Greenbelt Bus Stop Ranking

On Street	At Street	Stop ID #	Score	Recommendations
SOUTHWAY RD	#11	100	71	
SPRINGHILL DR	CHERRYWOOD LN	6	71	
GREENBROOK DR	CHARTWELL PL	177	70.75	
CHERRYWOOD LN	IVY LN	56	70.75	
GREENBELT RD	63RD AVE	22	70.75	
HANOVER PKWY	GREENBELT RD (MD-193)	140	70.5	
IVY LN	RIDGE RD	73	70.5	
BREEZEWOOD DR	CHERRYWOOD TERR	52	70	
MANDAN RD	MANDAN RD	152	69.75	
RIDGE RD	NORTHWAY	87	69.75	
GREENBELT RD	BALT-WASH PKWY (MD-295) RAMP	136	69	
RIDGE RD	PLATEAU PL	84	69	
SPRINGHILL DR	MARKET LN	36	69	
SPRINGHILL LN	MARKET LN	45	69	
RIDGE RD	EASTWAY	89	68	
RIDGE RD	GARDENWAY	94	68	
RIDGE RD	HAMILTON PL	92	67.75	
SPRINGHILL LN	BREEZEWOOD CT	46	67.5	
EDMONSTON RD	SPRINGHILL CT	30	67.5	
CRESCENT RD	HILLSIDE RD	118	67.25	
CRESCENT RD	GREENHILL RD	129	67.25	
BELTWAY PLAZA	EAST MALL ENTRANCE / PK LOT	20	67	
LASTNER LN	JULIAN CT	74	66.5	
IVY LN	SERVICE RD	62	66.25	
LAKESIDE DR	WESTWAY	106	66.25	
HILLSIDE RD	LAUREL HILL RD	124	66	
SPRINGHILL DR	LAKESIDE DR	34	65.75	
MANDAN RD	GREENBELT RD	154	65.5	
RIDGE RD	RIDGE CT	77	65.5	
HILLSIDE RD	NORTHWAY	122	65.25	
RIDGE RD	#57 COURT	82	65	
RIDGE RD	NORTHWAY	86	65	
RIDGE RD	RIDGE CT	76	64.75	

City of Greenbelt Bus Stop Ranking

On Street	At Street	Stop ID #	Score	Recommendations
RIDGE RD	#11	110	64.25	
GREENHILL ROAD	LAUREL HILL RD	126	63.75	
RIDGE RD	#58 COURT	83	63.5	
HILLSIDE RD	CRESCENT RD	117	63.5	
EDMONSTON RD	SPRINGHILL DR	32	62.25	
HANOVER PKWY	MEGAN LN	184	62	
RIDGE RD	35 CT	91	61.25	
IVY LN	LASTNER LN	70	60.75	
CRESCENT RD	LASTNER LN	68	60.5	
GREENBELT	LAKECREST DR	135	60	
HILLSIDE RD	#6 COURT	119	59.5	
RIDGE RD	#21 CT	96	59	
LASTNER LN	JULIAN CT	75	58.75	
RIDGE RD	IVY LN	72	58.25	
BELTWAY PLAZA	SOUTH ENTRANCE MALL	19	57.5	
CRESCENT RD	CRESCENT CT	115	54.5	
CRESCENT RD	PARKWAY	116	54	
GREENBELT ROAD	MANDAN RD	156	53.75	
RIDGE RD	RESEARCH RD	78	53.5	
KENILWORTH AVE	CRESCENT RD	65	52.5	
KENILWORTH AVE	CRESCENT RD	64	50.25	
ORA GLEN DR	GREENBROOK DR	166	0	
MANDAN RD	HANOVER PKWY	148	0	
HANOVER PKWY	GREENBROOK DR	179	0	
GREENBELT STATION	BUS BAY B C D E F G	1	0	
GREENBELT STATION	BUS BAY A	2	0	