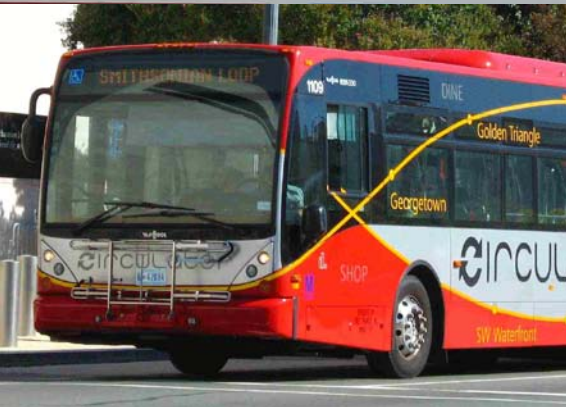


# Multimodal Coordination for Bus Priority Hotspots



Presentation to MOITS Policy Task Force And  
MOITS Technical Subcommittee

April 10, 2012

Parsons Brinckerhoff  
Sabra Wang & Assoc.

# Team Organization

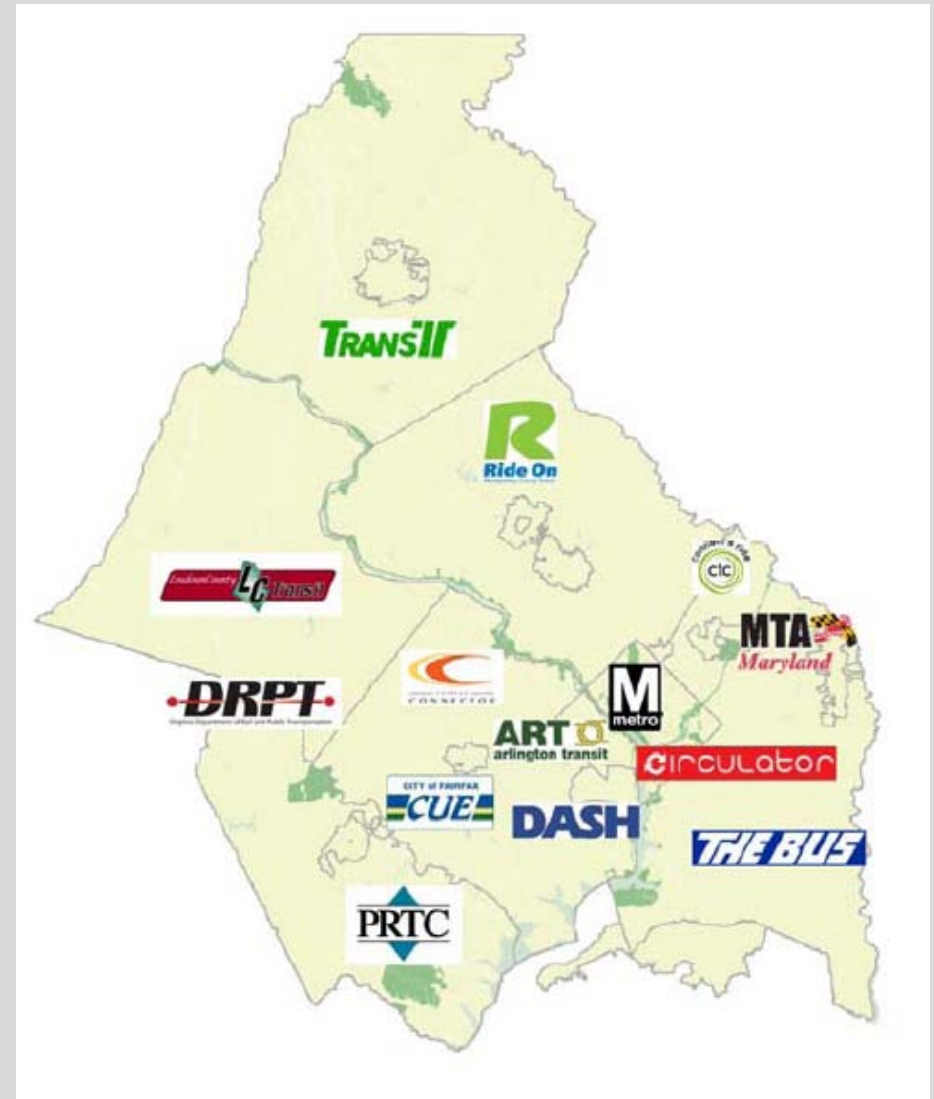
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- Coordination - **TPB**
- Technical Advisor – **WMATA Office of Long-Range Planning**
- Data and Observations – **Regional Transit Providers**
- Direction & Feedback – **Regional Stakeholders**
- Data Analysis, Field Verification, Reports – **Consultant Team**
  - **Parsons Brinckerhoff** – Prime, Hot Spots Verification, Design Concepts
  - **Foursquare ITP** – Database Development, Hot Spots List
  - **Sabra, Wang & Associates** – Traffic Analysis

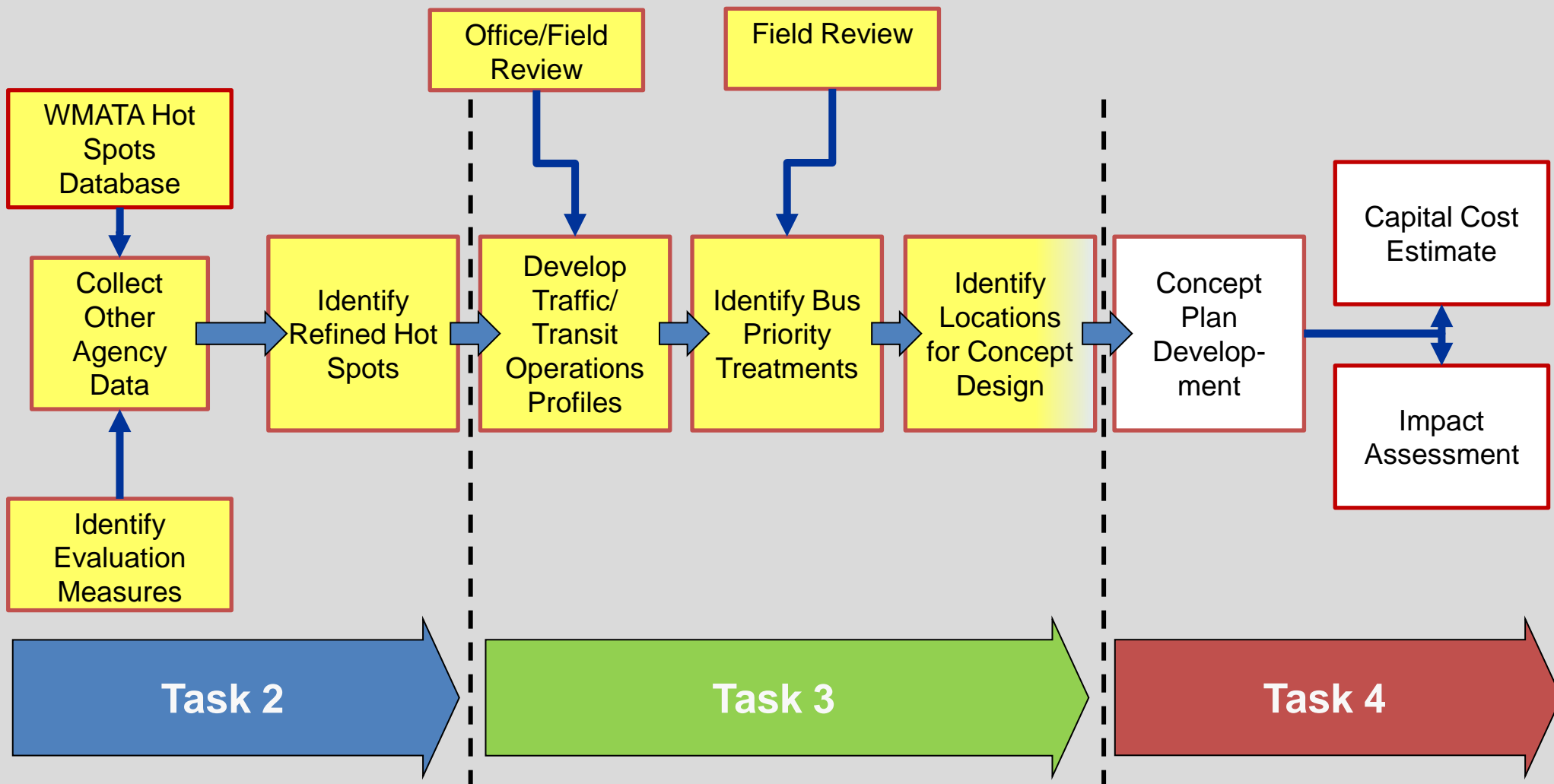
# Beyond Metrobus – Additional Systems Incorporated

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- Core Agencies
  - Ride On
  - Fairfax Connector
  - DASH
  - DC Circulator
  - ART
  - CUE
  - The BUS
- Commuter Bus
  - MTA Commuter Bus
  - Omni-Ride
  - LC Transit
- Non Core Agencies
  - TransIT
  - Connect-a-Ride



# Study Approach

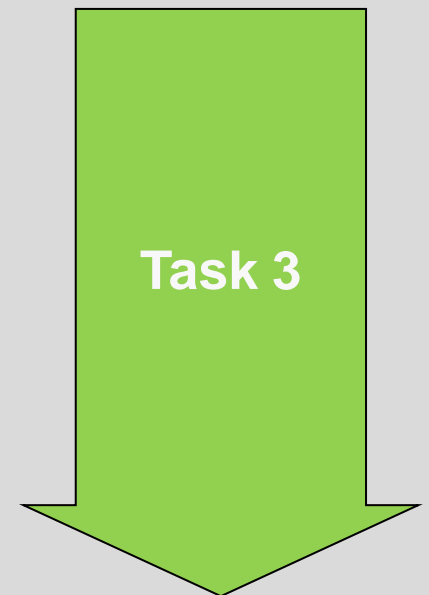
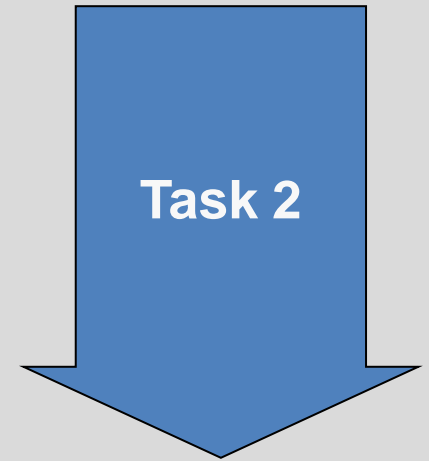


 Completed task

# Initial Hotspot Database

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- Top 15 sites initially identified in each jurisdiction – 3 lists
    - AM peak delay
    - PM peak delay
    - All-day delay
- 
- Initial screening – January 25 team work session
    - Parallel planning efforts
    - Terminus/layover locations
  - Agency comments received
  - Study team identified final top 10 hot spots by jurisdiction



# Desired Input from Meeting Participants

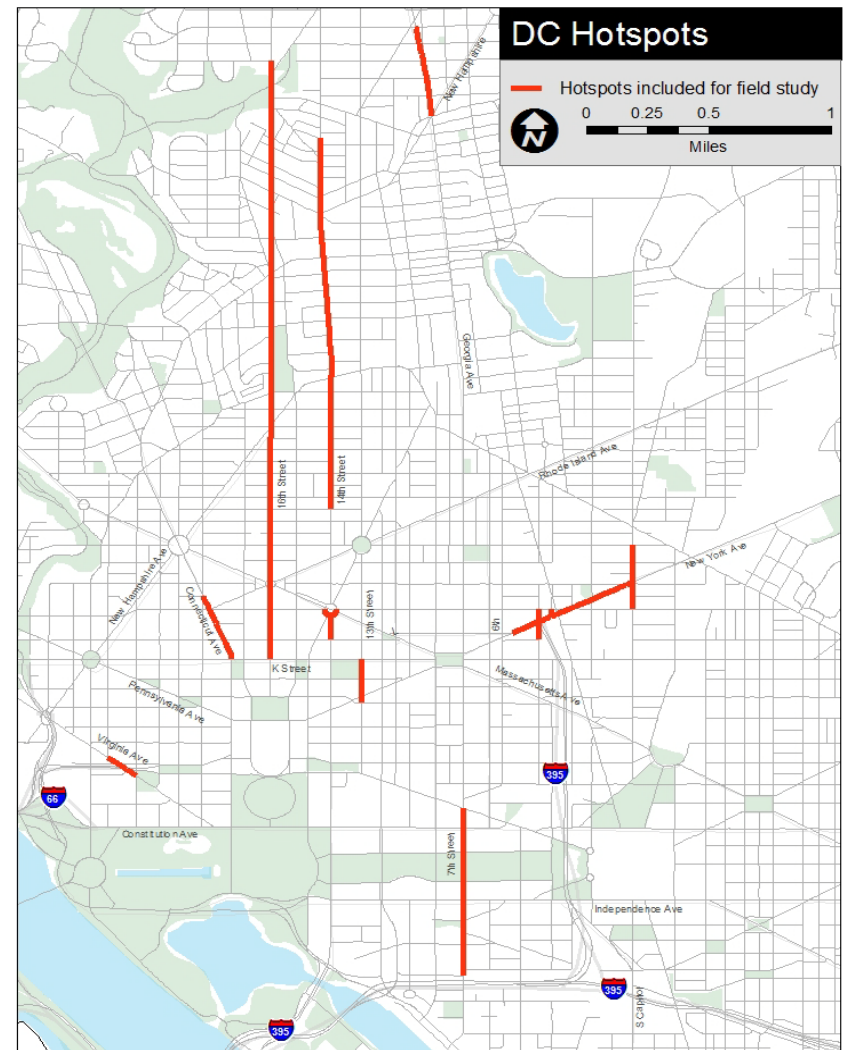
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- Feedback on field survey general findings
- Findings for specific locations
- Input for methods to consider in Task 4
- Go/No recommendations on sites for Task 4



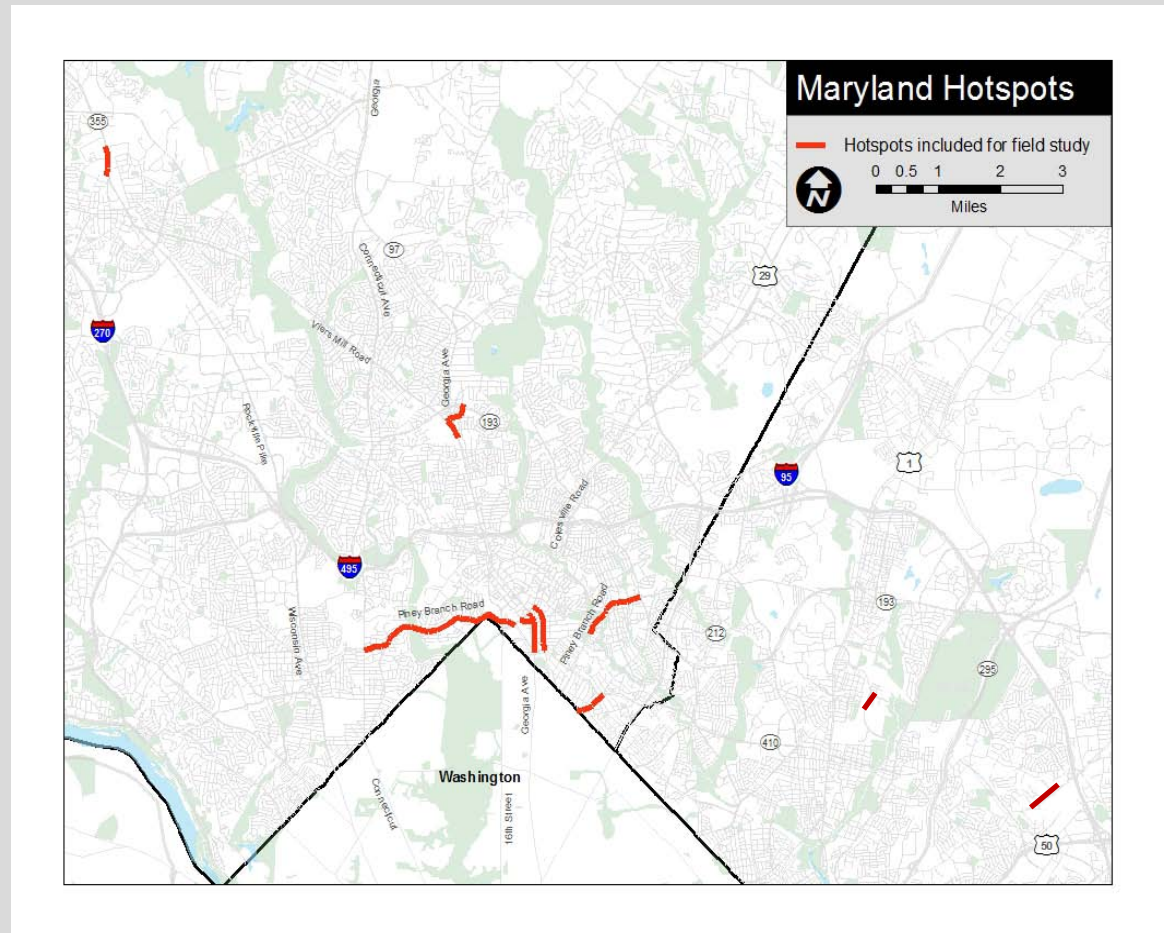
# Top 10 DC Hotspots

- Virginia Ave. NW – E St. to D St.
- Georgia Ave. NW – Upshur St. to New Hampshire Ave.
- Wisconsin Ave. NW & Q St.
- 7<sup>th</sup> St. NW/SW – I-395 to Pennsylvania Ave.
- Connecticut Ave. – K St. to Jefferson Pl.
- 14<sup>th</sup> St. NW – Corcoran to Otis Sts.
- Thomas Circle (southern half) & 14<sup>th</sup> St. NW (to L St.)
- New York Ave./N. Capitol St.
- 13<sup>th</sup> St. NW – H St. to K St.
- 16<sup>th</sup> St. NW – K St. to Shepherd St.



# Top 10 Maryland Hotspots

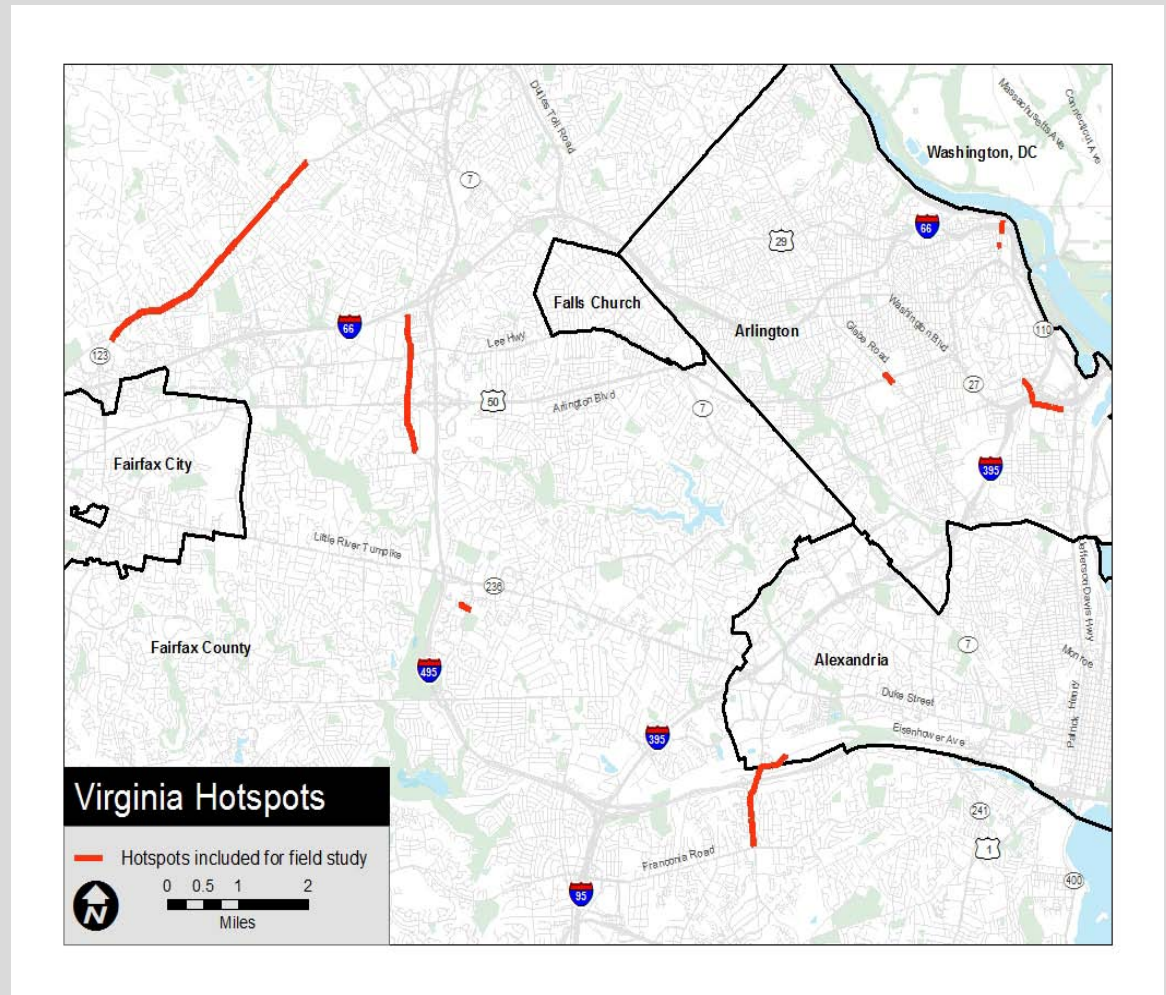
- Georgia Ave. – 13<sup>th</sup> St. to Colesville Rd.
- River Rd. at Paint Branch Dr.
- Veirs Mill Rd./Reedie Dr./Amherst Ave.
- Fenton St. – MD 410 to Colesville Rd.
- East-West Hwy. – Georgia Ave. to Connecticut Ave.
- Piney Branch Rd. – MD 193 to Sligo Ave.
- Carroll Ave. – Maple St. to Ethan Allen Rd.
- Hungerford Dr. – Washington St. to Ivy League Ln.
- Annapolis Rd. – Finns Ln to Riverdale Rd.
- Wayne Ave. – Georgia Ave. to Colesville Rd.





# Top 10 Virginia Hotspots

- Wilson Blvd. – Ft. Myer Dr. to Moore St.
- Lynn St. – Key Bridge to 19<sup>th</sup> St.
- Joyce St. – Columbia Pike to Army-Navy Dr.
- Gallows Rd. – Belleforest Dr. to Inova Hospital
- Army Navy Dr. – Eads St. to Joyce St.
- Van Dorn St. – Eisenhower Ave. to Franconia Rd.
- SB Glebe at Arlington Blvd.
- Patriot Dr. – Lafayette Forest Dr. to Heritage Dr.
- Eisenhower Ave. – Van Dorn St. to Van Dorn Metrorail station
- Route 123 – Jermantown Rd. to Folin Ave.



# Field Verification Process

- Initial desktop inventory and traffic assessment
  - AM and PM peak period turning movements
  - Intersection level of service
  - Lane configuration
  - Bus stop locations
  - Bus routings
- Data collection worksheet
  - Sidewalks, curb ramp ramps, and crosswalks
  - Traffic and pedestrian signals
  - Bike lanes
  - Parking restrictions
  - Roadway width
  - Posted speed limits
  - Bus stop amenities

LOCATION: VIERS MILL RD-REEDIE RD-AMHERST AVE MD

DATE: 2/7/2012	PB (PHONE)	SWA (PHONE)
TIME: 4:30 PM - 5:30 PM	Joe Barr (857-205-8054)	Randy Burks (301-514-3918)
MEET AT: 4:00 PM Wheaton Metro	Brian Lavery (202-213-6914)	Alyssa May (860-803-7261)

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CHECKLIST:

Complete field worksheet

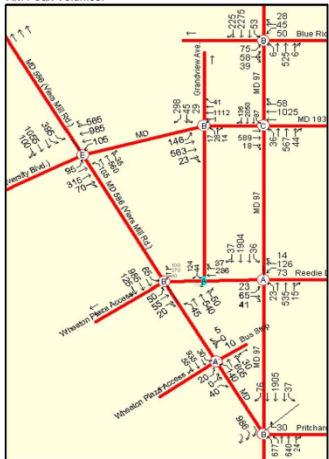
Complete at least 2 runs in each direction with Go Pro Camera

Go Pro Instructions:

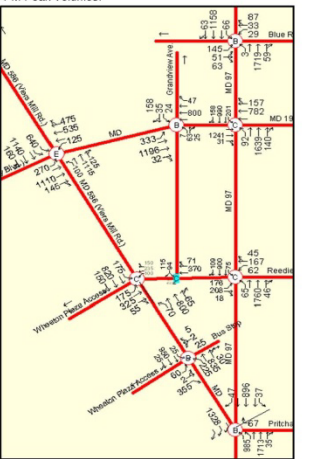
1. Use the suction cup to FIRMLY attach the Go Pro Camera to the roof of your car.
2. Press and hold the button on the FRONT of the camera to power the device ON.
3. Press the shutter button on the TOP of the camera to begin recording.
4. MAKE SURE THE RED LIGHT IS FLASHING. OTHERWISE THE CAMERA IS NOT RECORDING!
5. When finished recording, press the shutter button on TOP to stop recording.
6. Turn the device off by pressing the power button on the FRONT.
7. Download video and name file 07PM1\_Viers

ADDITIONAL DATA:

- Viers Mill Rd-Reedie Rd-Amherst Ave Limits: Georgia Ave to MD 193
- Ranked 12 AM, 8 PM and 4 All Day
- AM Peak Volumes:

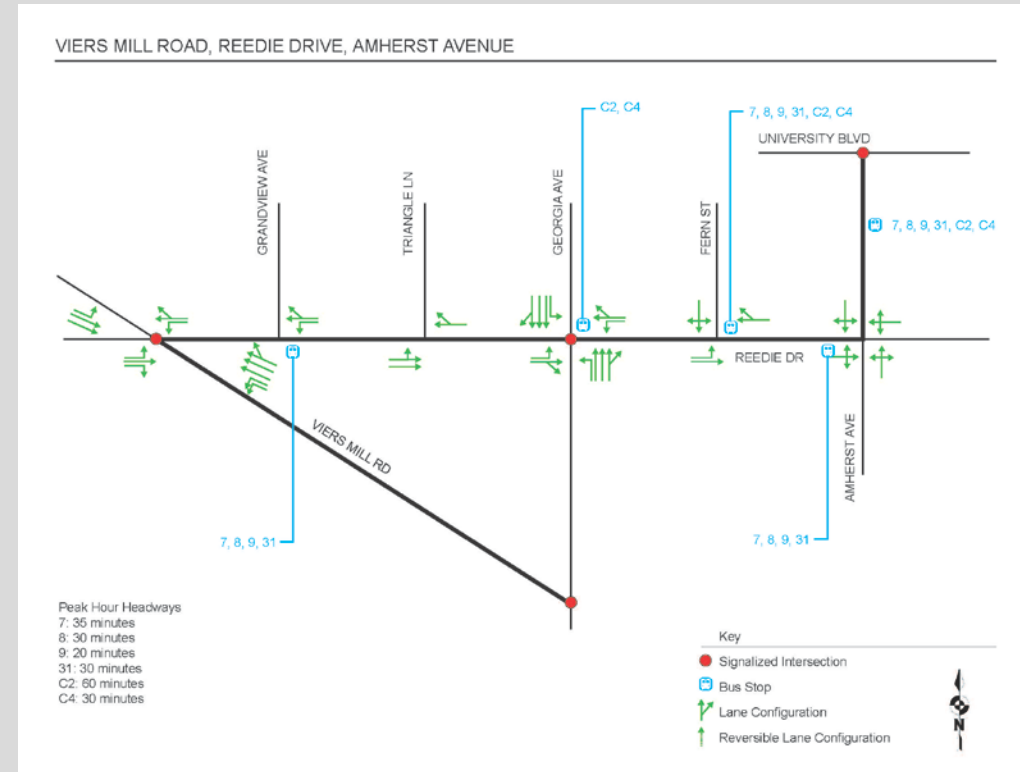


- PM Peak Volumes:



# Field Verification Process

- Identified critical peak period for hot spot site evaluation
- Each hot spot observed by a team including transit planners & traffic engineers
- Survey periods
  - February 6-8
  - February 20-22
  - Focus on Tuesday-Thursday
- Use of video camera
  - Recorded 2 travel time runs in each direction



# Overall Considerations

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- Bus operations should experience significant delay
- Bus should not be at layover location
- Number and location of bus stops – too many? In right location?
- Pedestrian/bicycle access and safety
- Locations where traffic signal timing appears to be inadequate
- Right-of-way constraints to any infrastructure improvements

# Identify Bus Priority Treatments

- Corridor/Segment-Level

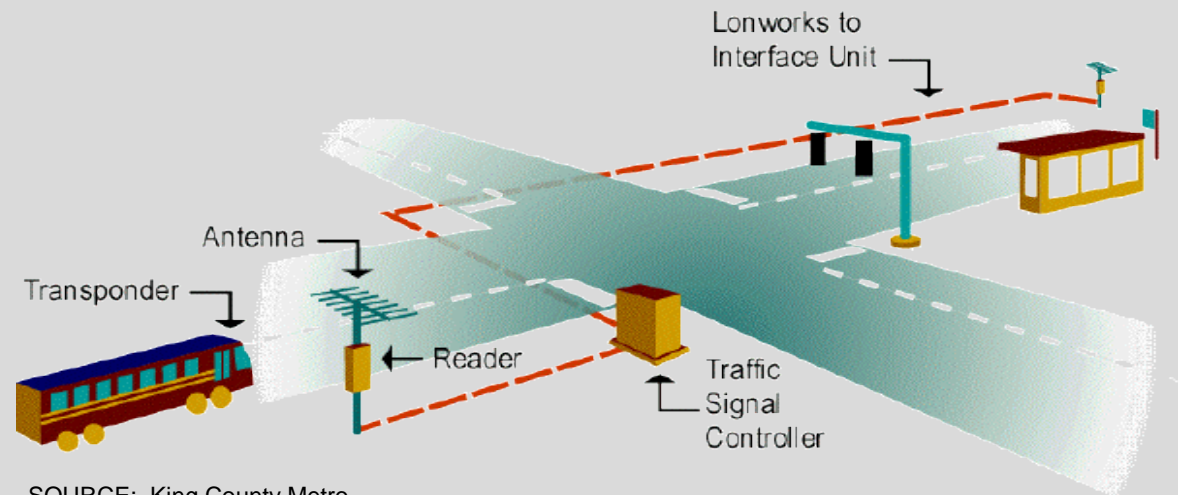
- Exclusive Lanes
- Signal priority – system application (TSP)
- Passive Signal Coordination
- Stop Consolidation



SOURCE: TCRP Report 118 (5)

- Intersection-Level

- Isolated TSP
- Queue-jump signal
- Bypass Lane
- Curb Extension
- Stop Relocation



SOURCE: King County Metro




# Field Verification Summary - DC

Street(s)		Rankings			Potential for Improvements			
		Daily	AM	PM	Physical	Transit	Signal	Long-Term
	Virginia Ave. NW	1	2					
	Wisconsin Ave. NW	9			x	x		
	7 <sup>th</sup> St. NW/SW	10	14	3			x	
	Connecticut Ave.	11		2				
1	14 <sup>th</sup> St. NW	13	10	8	<b>X</b>	<b>X</b>		
	Thomas Circle & 14 <sup>th</sup> St. NW	15		9				
2	New York Ave./N. Capitol St.				<b>X</b>		<b>X</b>	
	13 <sup>th</sup> St. NW		4	5	x			
	Georgia Ave. NW		9		x		x	
	16 <sup>th</sup> St. NW		12			<b>X</b>		

x = Some potential for improvements

**X** = Strong potential for improvements

 = Recommended for concept design

# DC #1 – 14<sup>th</sup> St. NW

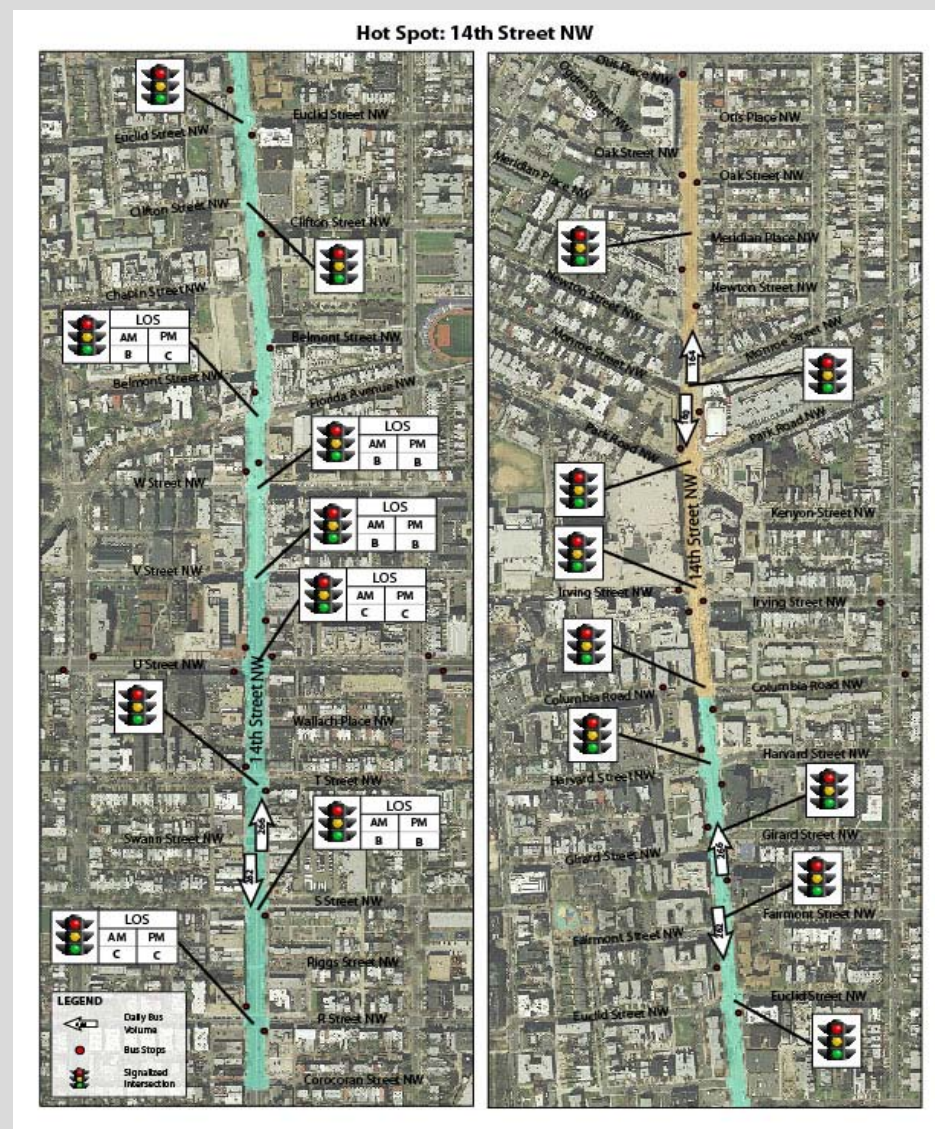
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- Problems Observed
  - Traffic congestion NB and SB
  - Several traffic signal cycles for buses to clear intersection
  - High pedestrian activity and bus boardings/amenities
  - Bus Bunching along 52 and 53 routes



# DC #1 – 14<sup>th</sup> St. NW

- Potential physical improvements
  - Remove bike lanes and install bus lane in one direction – Irving to Logan Circle
  - Restrict parking along 14<sup>th</sup> to create bus lane
- Potential transit operations improvements
  - Move near side stops to far side
  - Consolidation of bus stops
  - Implement express or limited stop service



# DC #2 – N. Capitol St.

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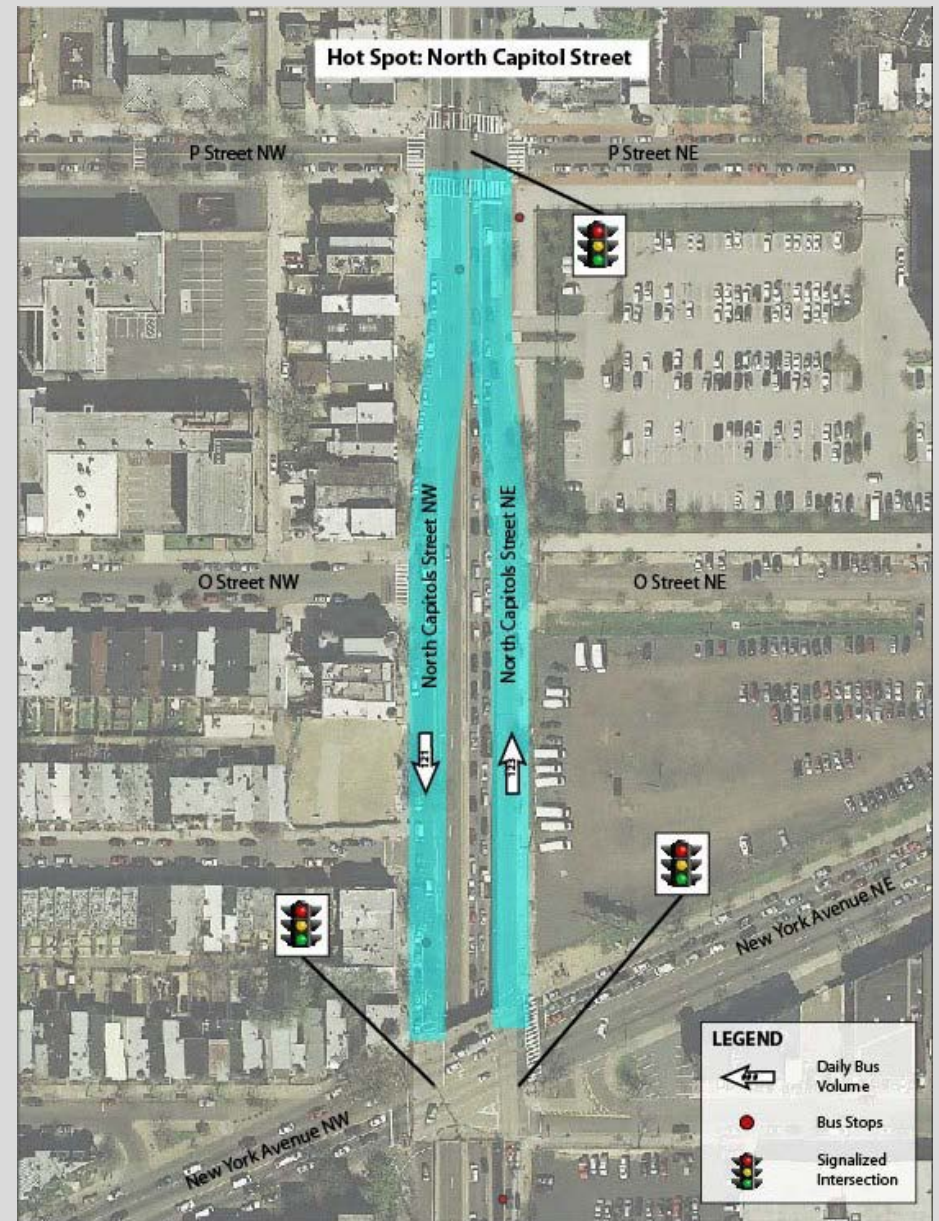
- Problems Observed
  - Six-lane undivided section heavily congested
    - AM queues spill back to 4<sup>th</sup> past Florida Ave.
  - Significant bus congestion on N. Capitol St. service roads
    - Very busy stops
    - Buses in SB service lane significantly delayed





# DC #2 – N. Capitol St.

- Potential physical improvements
  - Bus lanes along N. Capitol St. service roads
- Potential signal timing improvements
  - Review signal timing at New York Ave./N. Capitol St. to reduce SB queuing
  - Deploy point control traffic officer to reduce intersection blockage






# Field Verification Summary - Maryland

		Street(s)	Rankings			Potential for Improvements			
			Daily	AM	PM	Physical	Transit	Signal	Long-Term
		Georgia Ave.	2	4	4	x			<b>X</b>
		River Rd/Paint Branch Dr.	3	14			x		<b>X</b>
1		Veirs Mill Rd./Reedie Dr.	4	12	8	<b>X</b>		<b>X</b>	<b>X</b>
		Fenton St.	5	6	7	x			
		East-West Hwy.	6	7	5	<b>X</b>			
2		Piney Branch Rd.	7	10	10	<b>X</b>	<b>X</b>		
		Carroll Ave.	11		14	x			
		Hungerford Dr.	13						
3		Annapolis Rd.	15	9	15	<b>X</b>	<b>X</b>		
		Wayne Ave.		1	1				<b>X</b>

x = Some potential for improvements

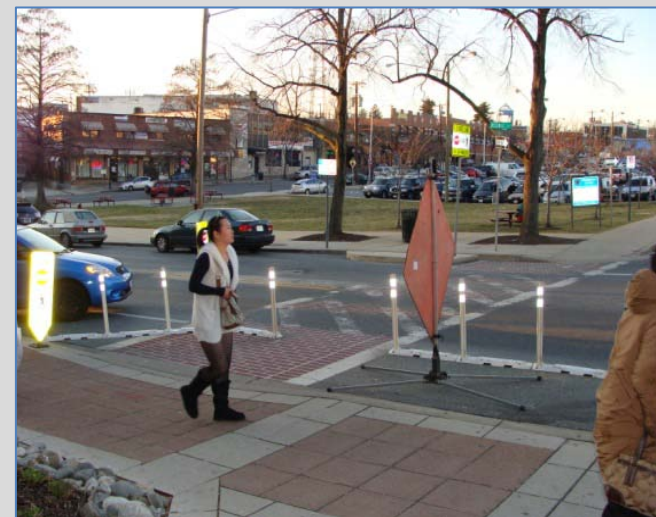
**X** = Strong potential for improvements

 = Recommended for concept design

# MD #1 – Reddie/Veirs Mill

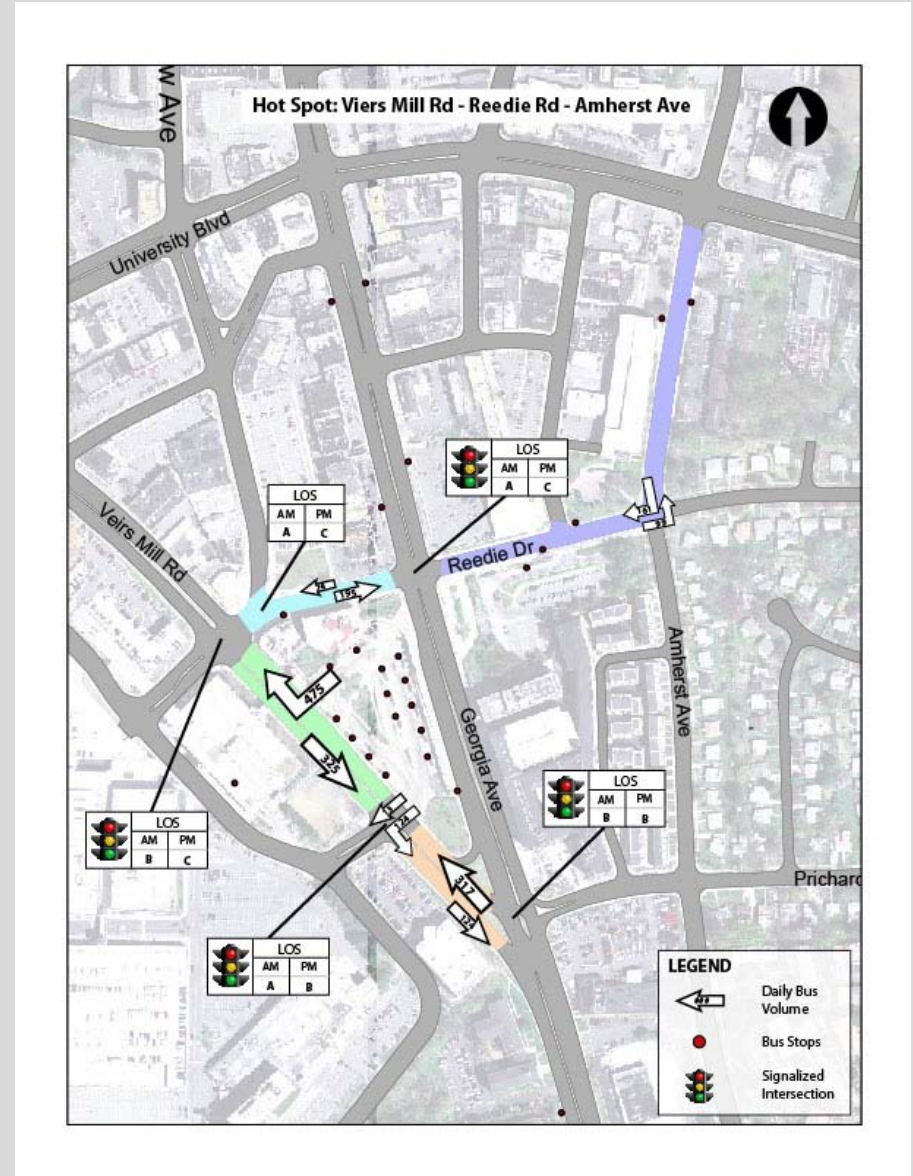
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- Problems Observed
  - Focus on Reddie between Veirs Mill Rd. and Georgia Ave.
    - Multiple, non-signalized access points from north create weave conflicts
    - Triangle Lane crosswalk lacks pedestrian signal – random pedestrian crossings
    - Left turn from Reddie onto Veirs Mill has conflicts with pedestrian crossings
  - Secondary impacts on Veirs Mill Rd.
    - SB queues at Metrorail station bus loop intersection inhibit bus access



# MD #1 – Reedie/Veirs Mill

- Potential physical improvements
  - Conversion of Reedie Dr. from Georgia to Grandview Aves. As transit-only street
  - Extension of left turn lane from Veirs Mill Rd. into Wheaton station bus loop
- Potential signal improvements
  - Assess signal timing along Veirs Mill Rd.
  - Consider protected left turn phasing at Veirs Mill/Reedie intersection
  - Install pedestrian signal at mid-block crosswalk on Reedie



# MD #2 – Piney Branch Rd.

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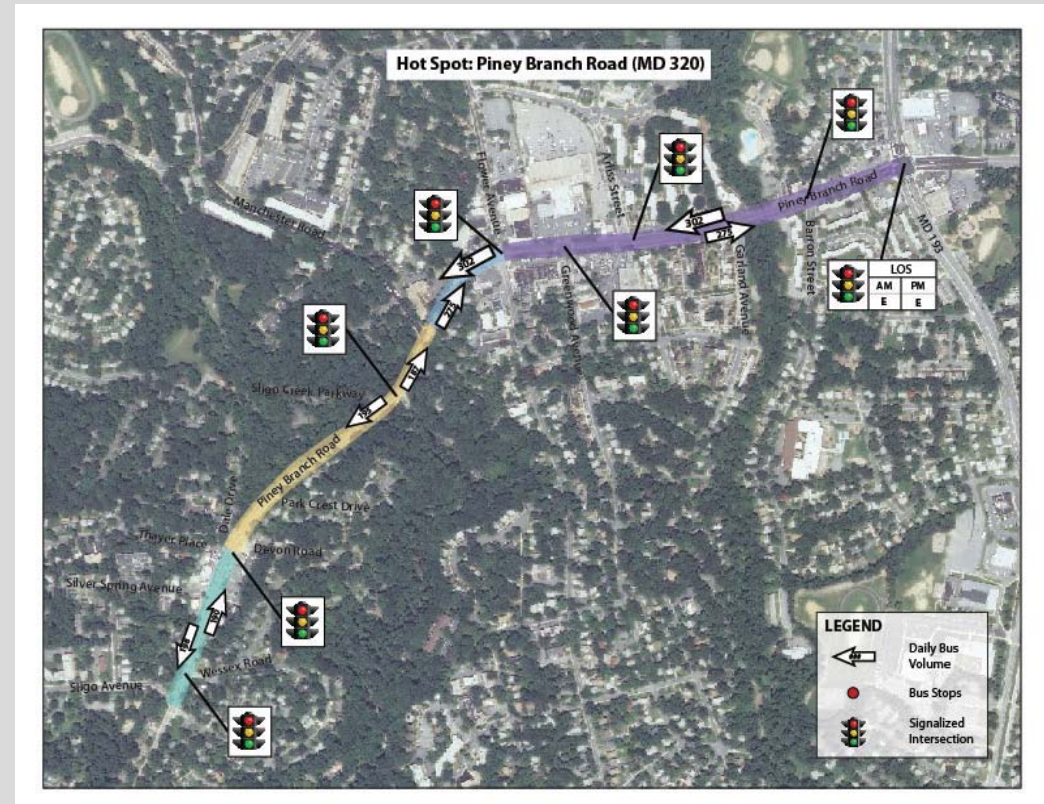
- Problems Observed
  - Close bus stop spacing and near side stops.
  - Bus bunching On Ride-On #15 and #16 routes
  - Pavement in poor condition, inhibiting bus speeds
  - Permissive left turn phasing increases bus delay





# MD #2 – Piney Branch Rd.

- Potential physical improvements
  - Install queue jump lanes
    - Dale Blvd. – NB
    - Flower Ave. – NB
    - University Blvd. – SB
  - Construct NB right turn lane at University Blvd.
  - Repave roadway
- Potential transit operations improvements
  - Eliminate near side stops
  - Consolidate bus stops
- Potential signal improvements
  - Provide transit signal priority
    - Arliss Ave., Dale Blvd., Baron Dr., Greenwood Ave., Sligo Creek Parkway, Sligo Ave.





# MD #3 – Annapolis Rd.

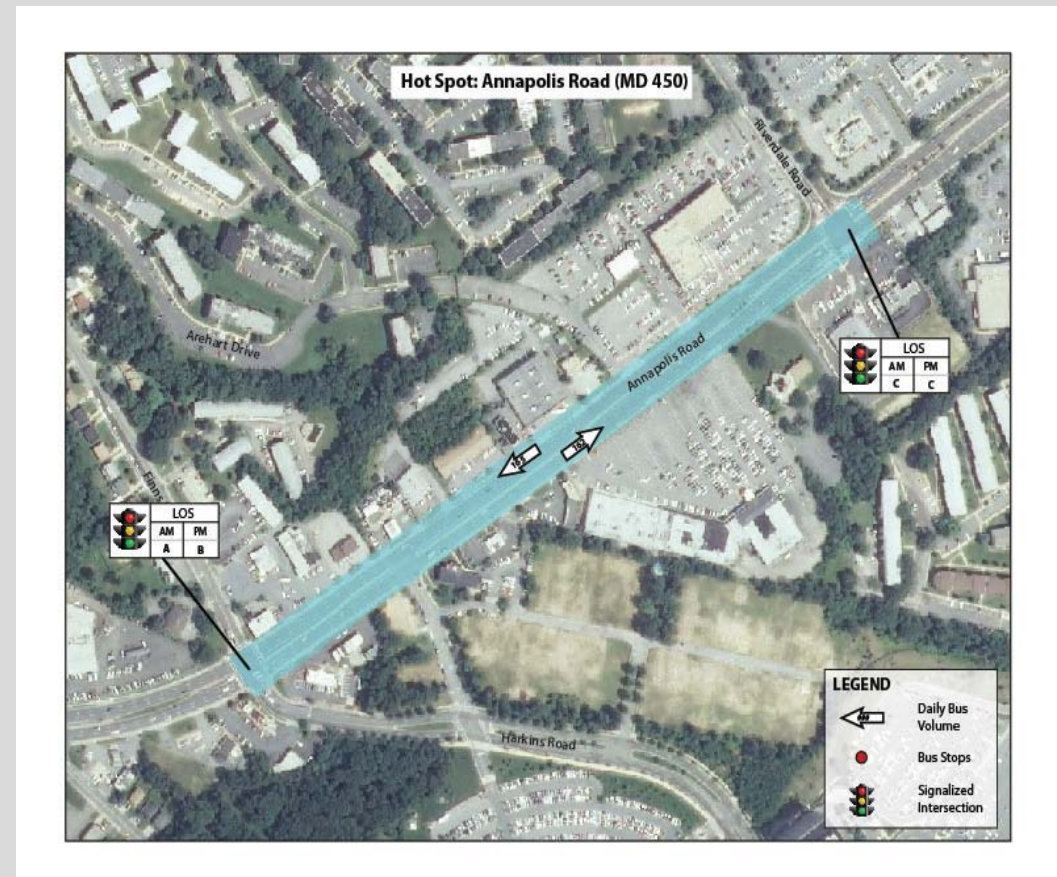
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- Problems Observed
  - Proliferation of bus stops
  - Mid-block pedestrian crossing
  - Bus left turn queuing at Riverdale Rd.



# MD #3 – Annapolis Rd.

- Potential physical improvements
  - Extend EB left turn lane at Riverdale Rd.
  - Improve curb return on SW corner of Finns Ln. intersection, and/or relocate stop bar
- Potential transit operations improvements
  - Consolidate bus stops
  - Potential conversion of curbside traffic lanes to bus lanes
- Potential transit operations improvements
  - Signal priority at Harkins Rd.
  - Mid-block pedestrian signal
  - Countdown pedestrian signals at Riverdale Rd. intersection




# Field Verification Summary - Virginia

	Street(s)	Rankings			Potential for Improvements			
		Daily	AM	PM	Physical	Transit	Signal	Long-Term
	Wilson Blvd.	5		15				
	Lynn St.	9	6	8				
	Joyce St.	10						
	Gallows Rd.	12	12					<b>X</b>
	Army/Navy Dr.	14	4					
2	Glebe Rd./Arlington Blvd.		2	1	x	x	x	
	Patriot Dr.		5					
	Eisenhower Ave.		8			x	x	
1	Van Dorn St.				<b>X</b>	x		
	Route 123				<b>X</b>		<b>X</b>	

x = Some potential for improvements

**X** = Strong potential for improvements

 = Recommended for concept design

# VA #1 – Van Dorn St.

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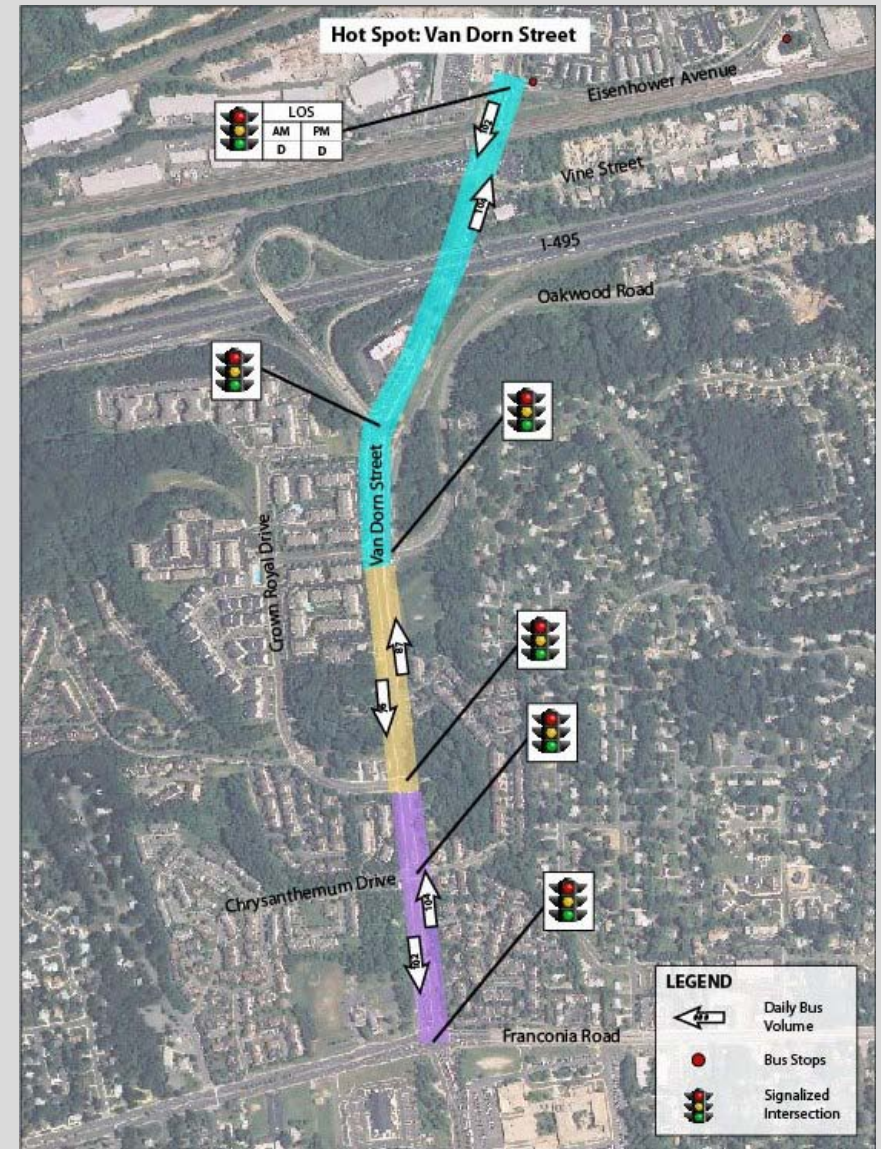
- Problems Observed
  - Heavy traffic congestion and uneven lane utilization on NB Van Dorn St.
  - Multiple signal cycle failures, particularly at Eisenhower Ave.
  - Buses operating in mixed traffic experience significant delay





# VA #1 – Van Dorn St.

- Potential physical improvements
  - NB bus queue jumps on Van Dorn St.
    - I-495 ramp
    - Chrysanthemum Dr.
    - Crown Royal Dr.
    - Oakwood Rd.
  - Reconfigure SB Van Dorn approach to Eisenhower Ave.
- Potential transit operations improvements
  - Limited stop service on Van Dorn St.
- Potential signal improvements
  - Right turn signal overlap for WB Eisenhower Ave.





## VA #2 – Glebe Rd.

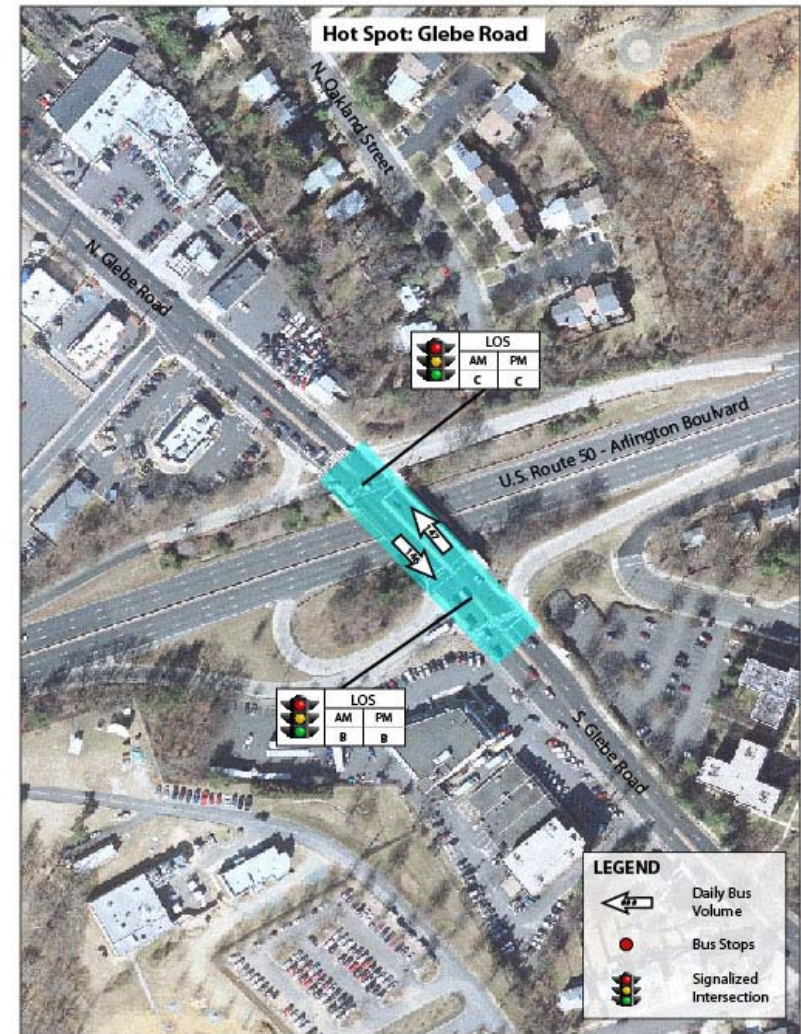
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- Problems Observed
  - Left turns on NB Glebe Rd. onto WB Arlington Rd. ramp back up through traffic (to 2<sup>nd</sup> St. S) – no left turn lane
  - SB bus stop on Glebe Rd. has conflicts with adjacent shopping plaza access
  - Inadequate EB Arlington Rd. bus stop area

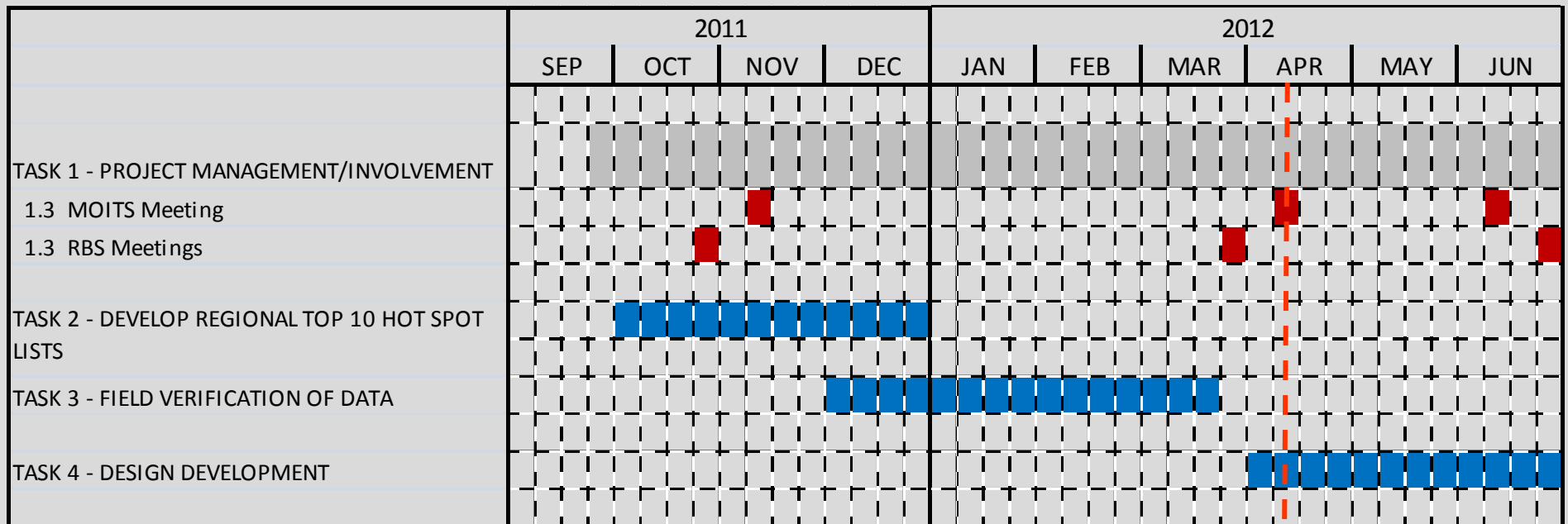


# VA #2 – Glebe Rd.

- Potential physical improvements
  - VDOT is widening Glebe Rd. bridge to add NB left turn lane
  - Convert existing bus pullout on NB Glebe to bus queue jump lane with signal
- Potential transit operations improvements
  - Improvements to bus stops on Glebe Rd. north of Arlington Rd..
    - shelters, other amenities
  - Improvements to bus stop on SB Glebe south of Arlington Rd. – meet ADA requirements and not conflict with shopping plaza access
  - Improvements to EB Arlington Rd. bus stop



# Study Schedule



# Task 4 - Concept Plan Development

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- Concept Layouts with infrastructure improvements
  - Six locations
  - Minimal or no ROW impact
  - 15% level of design
  - Use of scaled aerial photography
- Capital Cost Estimates
  - Limited number of quantities
  - Prior approval of unit costs
  - Could translate to FTA SCC format



# Task 4 - Impact Assessment

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- Transit Operations
  - Unit travel time savings
  - On-time performance
  - Estimated bus operating cost savings – 5 & 20 years
  - MWCOG PCN Study and TCRP Synthesis 83
- Traffic Operations
  - Intersection LOS
  - Arterial Speeds
  - Queues
- Before and after impact summary