



the MET

DDOT's **M**ultimodal Measures of **E**ffectiveness **T**ool

Neelima Ghanta PE, DDOT
Allysha Lorber AICP, Mead & Hunt

Spring 2025

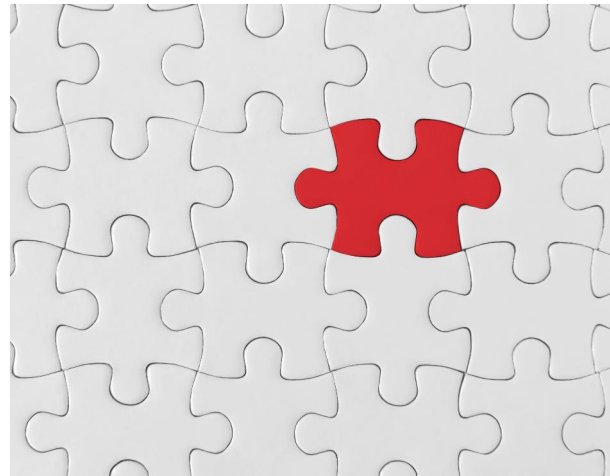
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Presentation Outline

- Purpose and Need
- Best Practices Review
- Custom Tool Development
- Next Steps



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Project Needs

- Lack of Sophisticated Models/Metrics for all modes
- No nationally accepted standard or practice exists
- Can't improve what you can't measure

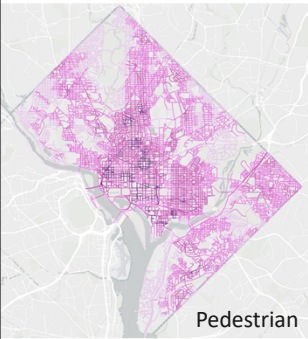


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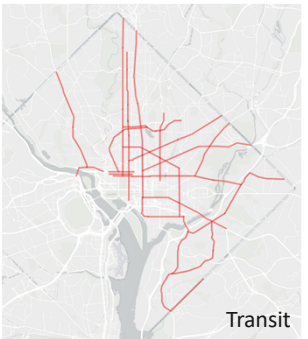



STRATEGY 14

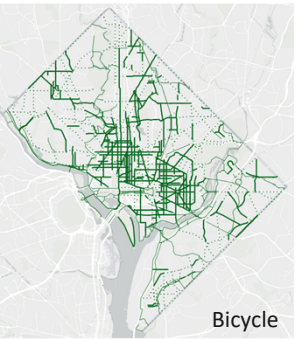
Develop new ways to measure the effectiveness of different modes in projects



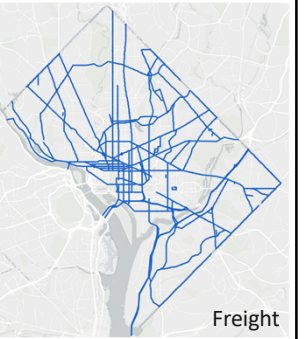
Pedestrian





Transit



Bicycle



Freight

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Project Goals

- Multimodal from ideas to implementation
- Assess tradeoffs
- Communicate compromises to public
- Consistent complete streets approach
- Fit DDOT's context and standards
- Easy to use!



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Literature Review – Peer Jurisdictions and Industry Publications

- International Review



- Industry Publications: NACTO, TRB, ITE, NCHRP 616, 969, 992



- Advocacy Groups (Smart Growth, Vision Zero Network)

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Literature Review – DDOT Standards and Publications



Custom DDOT Measures of Effectiveness need to integrate DDOT policies and standards

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Technique 1: HCM 6 Excel Link Level Analysis

Ped/Bike Link Level Analysis – The LOS score is a “typical” pedestrian’s or bicyclist’s perception of the overall travel experience

- Pros
 - Good for widescale network analysis
 - Less data intensive
 - Can be spreadsheet based
- Cons
 - Complicated formula
 - Does not include boundary intersections
 - Does not consider pedestrian space, crossing difficulty, or intersection service

Step 6: Determine Pedestrian LOS Score for Link

The pedestrian LOS score for the link $I_{p,link}$ is calculated with Equation 18-32.

$$I_{p,link} = 6.0468 + F_{pk} + F_v + F_s$$

with

$$F_{pk} = -1.2276 \ln(W_{t0} + 0.5 W_{t1} + 50 P_{pk} + W_{out} F_b + W_{out} F_{sa})$$

$$F_v = 0.0091 \frac{V_{pk}}{N_{lk}}$$

$$F_s = 4 \left(\frac{S_g}{100} \right)^2$$

where

$I_{p,link}$ = pedestrian LOS score for link;

F_{pk} = cross-section adjustment factor;

F_v = motorized vehicle volume adjustment factor;

F_s = motorized vehicle speed adjustment factor;

$\ln(x)$ = natural log of x ;

W_{t0} = effective total width of outside through lane, bicycle lane, and shoulder as a function of traffic volume (see Exhibit 18-19) (ft);

W_{t1} = total width of shoulder, bicycle lane, and parking lane (see Exhibit 18-19) (ft);

P_{pk} = proportion of on-street parking occupied (decimal);

W_{out} = buffer width between roadway and available sidewalk (= 0.0 if sidewalk does not exist) (ft);

f_b = buffer area coefficient = 5.37 for any continuous barrier at least 3 ft high that is located between the sidewalk and the outside edge of roadway; otherwise use 1.0;

W_{sa} = available sidewalk width = 0.0 if sidewalk does not exist or $W_{t1} - W_{out}$ if sidewalk exists (ft);

W_{t1} = total sidewalk width (ft);

W_{sa} = adjusted available sidewalk width = $\min(W_{t1}, 10)$ (ft);

f_{sa} = sidewalk width coefficient = $6.0 - 0.3 W_{sa}$;

v_{sa} = midsegment demand flow rate (direction nearest to the subject sidewalk) (veh/h);

N_{lk} = number of through lanes on the segment in the subject direction of travel (ft); and

S_g = motorized vehicle running speed = $(3,600 L)/(5,280 t_d)$ (mi/h).

Link-Based Pedestrian LOS	
Link-Based LOS Score	LOS
≤ 1.50	A
> 1.50–2.50	B
> 2.50–3.50	C
> 3.50–4.50	D
> 4.50–5.50	E
> 5.50	F

Link-Based Bicycle LOS Score	
Link-Based Bicycle LOS Score	LOS
≤ 1.50	A
> 1.50–2.50	B
> 2.50–3.50	C
> 3.50–4.50	D
> 4.50–5.50	E
> 5.50	F

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Technique 2: HCS7

Provides LOS score, which is an indication of the typical pedestrian's perception of the overall segment travel experience.

- Pros
 - Provides results for intersections, segments, and facilities
 - Scores by direction
- Cons
 - Requires detailed volume and movement inputs
 - All data from Synchro must also be manually entered
 - Limitations to integrate supplemental features that may improve access and safety

Pedestrian Mode - Streets

	EB	WB
Two-Way Ped Volume, ped/h	0	0
Ped Waiting Delay, sec/ped	0.0	0.0
Pedestrian Free-Flow Speed, ft/s	4.4	4.4
Downstream Intersection Width, ft	0	0
Sidewalk Presence	<input type="checkbox"/> EB <input type="checkbox"/> WB	
Inside Object Effective Width, ft	0.0	0.0
Outside Object Effective Width, ft	0.0	0.0
Buffer Width, ft	0.0	0.0
Nearest Signal Distance, ft	0	0
Sidewalk Length Adjacent to Window, Prop	0.00	0.00
Sidewalk Length Adjacent to Building, Prop	0.00	0.00
Sidewalk Length Adjacent to Fence, Prop	0.00	0.00
Hide Results	<input type="checkbox"/>	

Pedestrian Mode - Signals

	EB	WB	NB	SB
Permitted Left-Turn Flow, veh/h	0	0	0	0
Mid-Seg 85th % Speed, mi/h	0	0	0	0
Number Right-Turn Islands	0	0	0	0
Walkway Width, ft	9.0	9.0	9.0	9.0
Crosswalk Width, ft	12	12	12	12
Crosswalk Length, ft	0	0	0	0
Corner Radius, ft	25	25	25	25
Outgoing Ped Volume, ped/h	0	0	0	0
Incoming Ped Volume, ped/h	0	0	0	0
Circulating Ped Volume, ped/h	0	0	0	0
Rest-In-Walk Enabled	<input type="checkbox"/> EB <input type="checkbox"/> WB <input type="checkbox"/> NB <input type="checkbox"/> SB			
Pedestrian Signal Head	<input type="checkbox"/> EB <input type="checkbox"/> WB <input type="checkbox"/> NB <input type="checkbox"/> SB			
Crosswalk Closed	<input type="checkbox"/> EB <input type="checkbox"/> WB <input type="checkbox"/> NB <input type="checkbox"/> SB			
Hide Results	<input type="checkbox"/>			

Segment-Based Pedestrian LOS Score	Segment-Based LOS by Average Pedestrian Space (ft ² /p)					
	>60	>40-60	>24-40	>15-24	>8.0-15	≤8.0
≤2.00	A	B	C	D	E	F
>2.00-2.75	B	B	C	D	E	F
>2.75-3.50	C	C	C	D	E	F
>3.50-4.25	D	D	D	D	E	F
>4.25-5.00	E	E	E	E	E	F
>5.00	F	F	F	F	F	F

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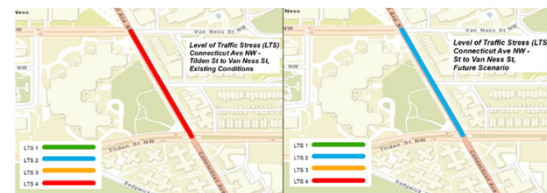
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Technique 3: Bicycle Level of Traffic Stress (LTS)

Excel based tool with look up tables based on lane widths, speed limit, parking, etc.

- Pros
 - Simple 1 to 4 ranking
 - Relatable and relatively simple
- Cons
 - Specific only to bicycle facilities
 - Simplicity doesn't capture all elements that can influence safety and comfort
 - Segment based analysis - typically shows no change for intersection improvements



Connecticut Ave NW Road Diet



Rhode Island Ave at 5th St NW – No change for intersection improvements

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Technique 4: Healthy Streets Score

Originated in UK, an internationally-adopted multimodal scoring tool with Excel-based scoring. Not widely used in the US.

- Pros
 - Relatable and relatively simple
 - High level of analysis
 - Easy to use with descriptive guidance and reference links
 - Includes placemaking, comfort, and environmental sustainability metrics
- Cons
 - Less detail - Doesn't capture all safety and mobility factors
 - Qualitative and can be subjective
 - Most relevant to urban contexts, does not capture suburban or rural contexts



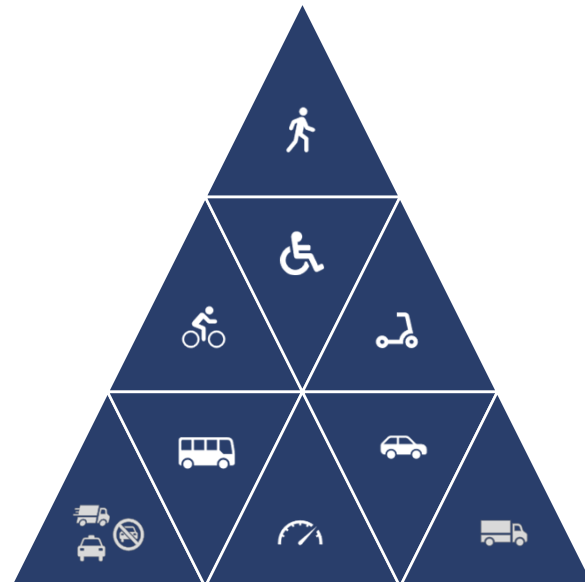
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The MET Basics

- Score each mode – safety and operations
- Weighted based on modal priority (1 vs 2)
- Compare alternatives for all modes



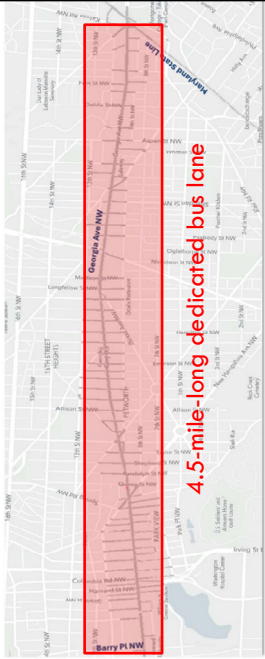
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Case Study – Transit (Bus) Project

Georgia Ave NW: Barry Pl to Eastern Ave



4.5-mile-long dedicated bus lane

Bus Priority Network

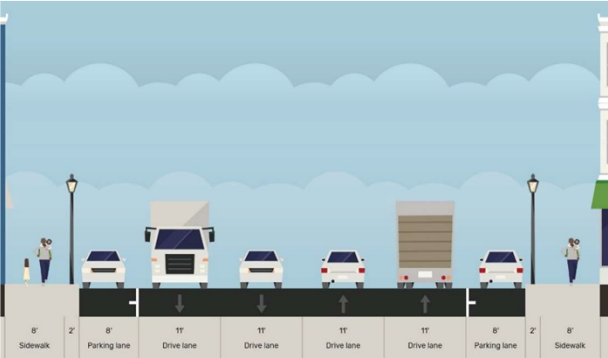
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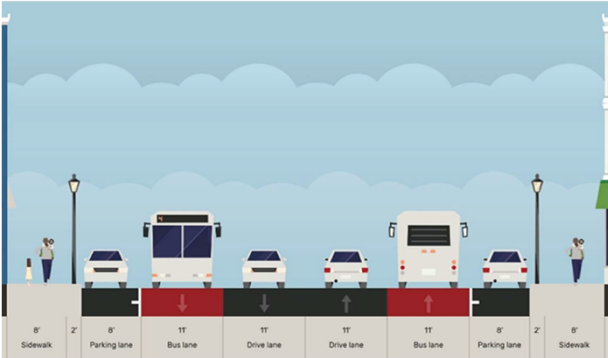
Existing and Proposed Cross-Sections

Existing



6'	2'	6'	11'	11'	11'	11'	11'	6'	2'	6'
Sidewalk	Parking lane	Drive lane	Drive lane	Drive lane	Drive lane	Drive lane	Drive lane	Parking lane		Sidewalk

Proposed



6'	2'	6'	11'	11'	11'	11'	11'	6'	2'	6'
Sidewalk	Parking lane	Bus lane	Drive lane	Drive lane	Drive lane	Bus lane	Drive lane	Parking lane		Sidewalk

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Traditional MOE

- Vehicular LOS, delay, and queue
- Focusing on vehicular operational impact

Intersection	AM Peak Hour					
	No Build		Build		Build with Mitigations (No Diversion)	
	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
Georgia Avenue NW at Madison Street NW	10	A	73.4	E	73.4	E
Georgia Avenue NW at Longfellow Road NW	4.1	A	15.5	B	15.5	B
Georgia Avenue NW at Kennedy Street NW	20.7	C	155.4	F	155.4	F
Georgia Avenue NW at Ingraham Street NW	11.1	B	204.2	F	204.2	F
Georgia Avenue NW at Hamilton Street NW	0.1	A	0.3	A	0.3	A
Georgia Avenue NW at Gallatin Street NW	23	C	555.8	F	555.8	F
Georgia Avenue NW at Arkansas Avenue NW	8.1	A	42.7	D	42.7	D
Georgia Avenue NW at Farragut Street NW	5.2	A	6.2	A	6.2	A
Georgia Avenue NW at Emerson Street NW	1.8	A	6	A	6	A
Georgia Avenue NW at Decatur Street NW	10.5	B	138.3	F	138.3	F
Georgia Avenue NW at Buchanan Street NW	12.9	B	189.9	F	189.9	F
Georgia Avenue NW at Allison Street NW	7.1	A	123	F	123	F
Georgia Avenue NW at Webster Street NW	7.3	A	19.5	B	19.5	B
Georgia Avenue NW at Iowa Avenue NW	3.9	A	7.5	A	7.5	A
Georgia Avenue NW at Kansas Avenue NW	20.7	C	170	F	170	F
Georgia Avenue NW at Upshur Street NW	10.6	B	169.6	F	171.2	F
Georgia Avenue NW at Taylor Street NW	9.6	A	337.5	F	146.3	F
Georgia Avenue NW at Shepherd Street NW	16.7	B	362.3	F	355.6	F
Georgia Avenue NW at Randolph Street NW	12.1	B	330.8	F	147.6	F
Georgia Avenue NW at Quincy Street NW	13.8	B	311.4	F	166.5	F
Georgia Avenue NW at New Hampshire Avenue NW	23.9	C	107.8	F	105.9	F
Georgia Avenue NW at Princeton Place NW	14	B	172	F	69.3	E
Georgia Avenue NW at Otis Place NW	2.8	A	155.7	F	157.1	F
Georgia Avenue NW at Park Road NW	20.5	C	337.1	F	137.3	F

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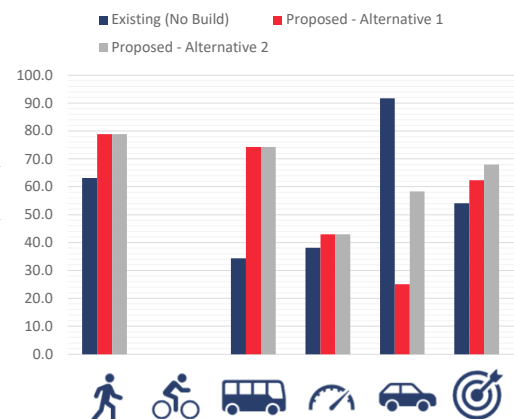
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MET Score (Multimodal MOE Summary)

Mode	Weight	Typical Section Score: Georgia Avenue - Barry Place to Eastern Avenue					
		Existing (No Build)		Proposed - Alternative 1		Proposed - Alternative 2	
		Score	MET	Score	MET	Score	MET
Pedestrian and ADA Compliance	2	63.2	4	78.9	5	78.9	5
Bicycle and Micromobility	1	N/A	N/A	N/A	N/A	N/A	N/A
Transit Access	2	34.3	2	74.3	5	74.3	5
Traffic Calming and Speed Management	1	38.1	2	42.9	3	42.9	3
Vehicular Operations and Capacity	1	91.7	5	25.0	1	58.3	4
Total Average Score and MET		54.1	3	62.4	4	67.9	4
Mode	Weight	Typical Section Score: Georgia Avenue - Barry Place to Eastern Avenue					
		Existing (No Build)		Proposed - Alternative 1		Proposed - Alternative 2	
		Score	MET	Score	MET	Score	MET
Freight Access	N/A	70.0	4	80.0	5	80.0	5
Curbside Management	N/A	42.9	3	42.9	3	42.9	3

Typical Section Score: Georgia Avenue - Barry Place to Eastern Avenue



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Progression towards full Adoption



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Web Application – In Development

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Project Boundary ☐

Carolina Ave Flooding

Overview Intersection Typical Section

PEDESTRIAN & ADA COMPLIANCE (18 Questions)

Save

A1. Crossing distance without a refuge

LEG	EXISTING	ALTERNATIVE 1	ALTERNATIVE 2
1 4th St SE	12' - 36'	Select	Select
2 N Carolina Ave SE	12' - 36'	Select	Select
3 Seward Sq SE	12' - 36'	Select	Select
4 4th St SE	12' - 36'	Select	Select
5 SE Leg N Carolina Ave	12' - 36'	Select	Select

Continue to Next

A2. ADA Compliance - Curb Ramps

A3. ADA Compliance - Sidewalk Widths

A4. ADA Compliance - Cross Slopes

A5. ADA Compliance - Pathway Slopes

A6. ADA Compliance - Obstructions

A7. ADA Compliance - Audible Signals

A8. Ped Warning Signs

A9. In-Crosswalk Signage

A10. Advanced Ped Warning Signs

A11. On street parking set backs from crosswalks

A12. Vehicle Control

A13. Right Turn Conflicts

A14. Left Turn Conflicts

The user completes A2 and Continues to A3

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The MET – DDOT's Custom Multimodal Scoring Tool

- Pros
 - All modes at the “table”
 - Custom to DDOT Standards and Guidance Manuals
 - Built to be updated “in-house” as we learn
 - Easy to understand - 1 to 5 score scale
 - Weighted based on modal priorities
 - Incentivized to reach higher - surpass minimum
 - Comparative
 - Both Segments and Intersections
- Cons
 - Time consuming
 - Some factors unknown at time of scoring
 - Not about “perfect” score of 100 – best for relative change



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