Travel Time Comparisons

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alexandriava.gov/DukeInMotion

DUKE STREET IN MOTION

Contents

Transportation Modeling Overview

- The following pages show traffic modeling results for the worst hour in the AM and PM peak in each direction.
- The **PM peak period has more congestion** than the AM, which is why the project team prioritized that period initially.
- The findings here are informative to compare the concepts, but there are many factors that are not fully captured, such as:
  - **Change in vehicle route choice** given changing volumes on Duke Street and the surrounding region.
  - **Change in Duke Street volumes** that could be attributed to some trips being taken using the BRT instead of cars.
  - **Further improvements** that may be possible as we finalize the design
  - **Enforcement of bus lanes**
- Concept A and B are compared to a **2030 "business as usual" scenario**, which is what would happen if this project were not built, but **includes population growth and other funded projects.** More information is available on p.11.

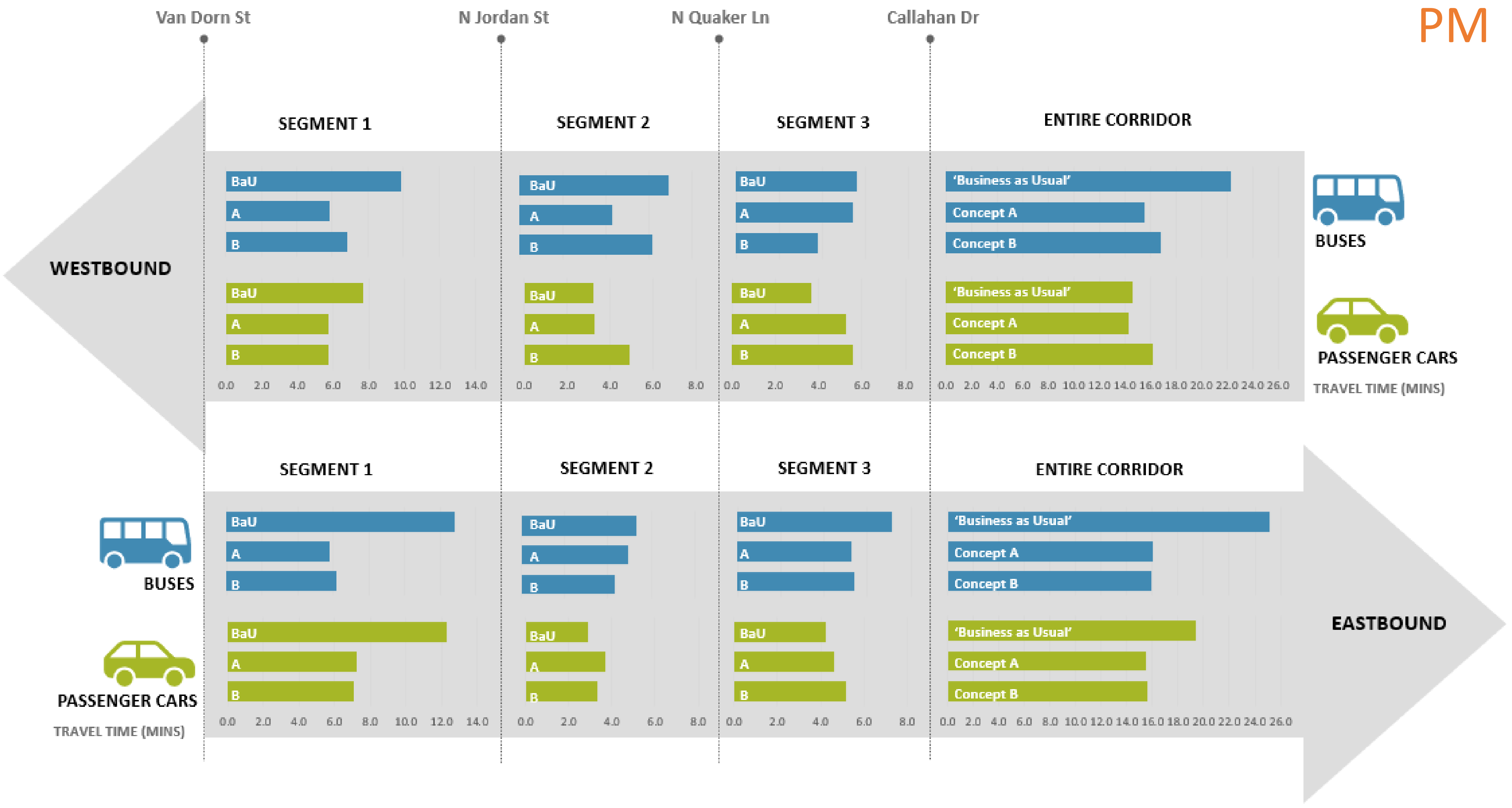
Scenario Summary

<table>
<tr><th>Segment</th><th>Business as Usual</th><th>Corridor Concept A</th><th>Corridor Concept B</th></tr>
<tr><td>1</td><td rowspan="4">Baseline comparison: roadway conditions if this project was not done</td><td>Mostly center-running</td><td>Curb-running</td></tr>
<tr><td>2A</td><td colspan="2">Mostly mixed-traffic</td></tr>
<tr><td>2B</td><td>EB center running</td><td>Mixed traffic</td></tr>
<tr><td>3</td><td>Center-running + mixed</td><td>Center running, curb-running, mixed traffic</td></tr>
</table>

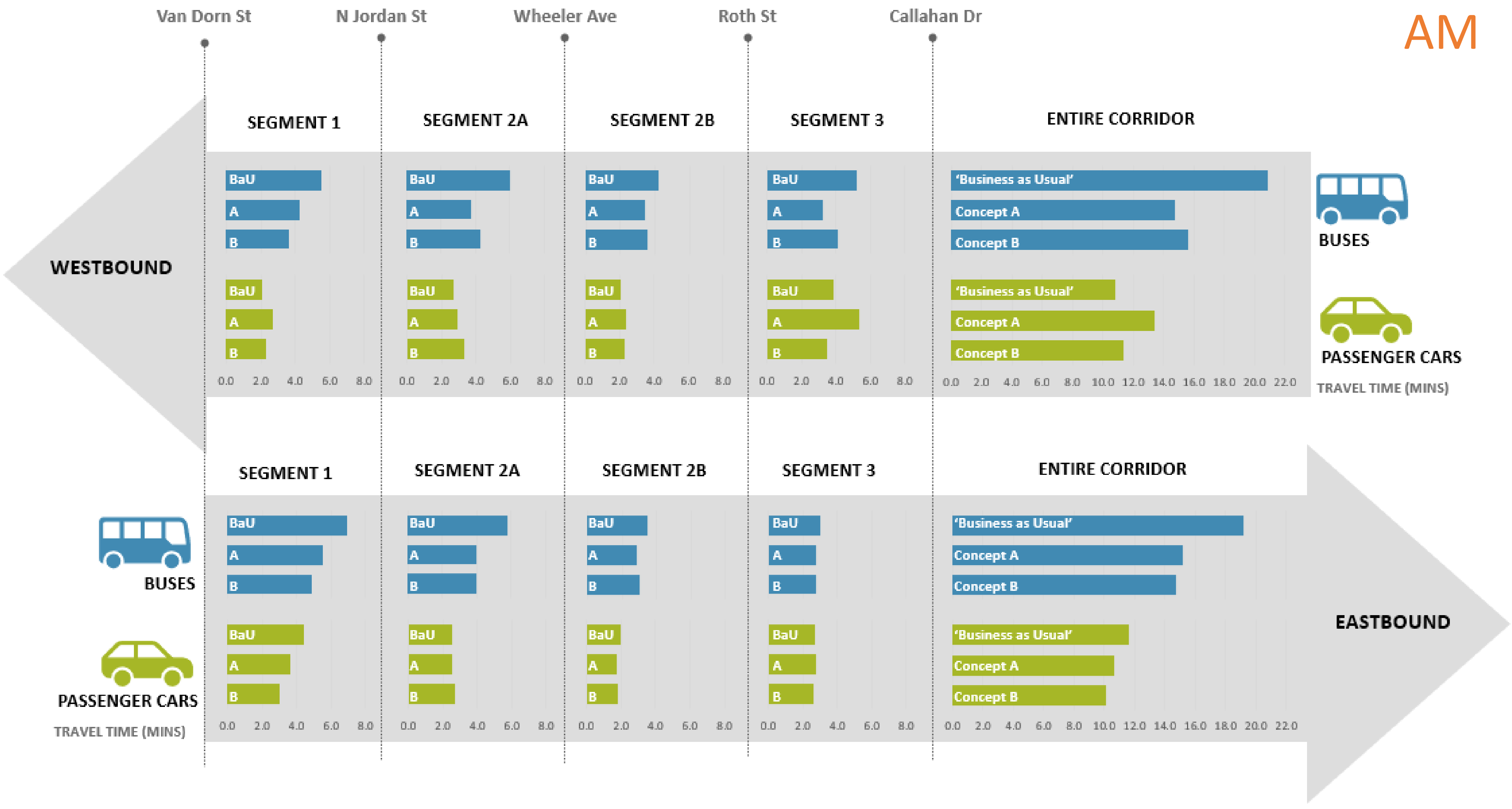
Overall Takeaways

- While there is some negative impact to vehicle travel in certain directions and segments, if you travel from West End Alexandria to King Street Metro in the AM and back in the PM or vice versa, the model indicates you will see a **net improvement for vehicle travel** on Duke Street for either concept.

- The model is generally showing similar travel time benefits for buses in the AM and PM peak between Concept A and B, with **Concept A performing slightly better overall due to improvements westbound**.



Duke Street in Motion – Travel Time Results for PM Peak Hour (Year 2030)



Duke Street in Motion -- Travel Time Results for AM Peak Hour (Year 2030)

Eastbound PM Peak Period
Travel Time Model Results by Timepoint

BUS TRAVEL TIMES	Length (mi)	2030 Business as Usual (min)	2030 Concept A Travel Time Change (min)	2030 Concept B Travel Time Change (min)
Van Dorn to Jordan	1.1	13	- 7	- 6 ½
Jordan to Quaker	1.1	5	- ½	- 1
Quaker to Callahan	1.3	7	- 2	- 2
Eastbound TOTAL	**3.6**	**25**	**- 9 ½**	**- 9 ½**

PASSENGER CAR TRAVEL TIMES	Length (mi)	2030 Business as Usual (min)	2030 Concept A Travel Time Change (min)	2030 Concept B Travel Time Change (min
Van Dorn to Jordan	1.2	12	- 5	- 5
Jordan to Quaker	1.1	3	1	½
Quaker to Callahan	0.5	4 ½	½	1
Eastbound TOTAL	**3.6**	**19 ½**	**- 4**	**- 4**

Travel Time Improvement* Compared to Business as Usual

Travel Time Deterioration* Compared to Business as Usual

*Totals and segment times rounded to the nearest ½ minute. Icon next to 0 change indicates directionality prior to rounding.

- Bus travel times improve by almost 40% for both.
- Vehicle travel times improve by almost 20%

Westbound PM Peak Period
Travel Time Model Results by Timepoint

BUS TRAVEL TIMES	Length (mi)	2030 Business as Usual (min)	2030 Concept A Travel Time Change (min)	2030 Concept B Travel Time Change (min)
Callahan to Quaker	1.3	10	- 4	- 3
Quaker to Jordan	1.1	7	- 2 ½	- ½
Jordan to Van Dorn	.9	5 ½	0	- 2
Westbound TOTAL	**3.6**	**25**	**- 7**	**- 5 ½**

PASSENGER CAR TRAVEL TIMES	Length (mi)	2030 Business as Usual (min)	2030 Concept A Travel Time Change (min)	2030 Concept B Travel Time Change (min
Callahan to Quaker	1.2	7 ½	- 2	- 2
Quaker to Jordan	1.1	3 ½	0	1 ½
Jordan to Van Dorn	0.9	3 ½	1 ½	2
Westbound TOTAL	**3.6**	**15**	**- ½**	**1 ½**

Travel Time Improvement* Compared to Business as Usual

Travel Time Deterioration* Compared to Business as Usual

*Totals and segments rounded to the nearest ½ minute. Icon next to 0 change indicates directionality prior to rounding.

- Bus travel time improvement is about 1.5 min greater in Concept A.
- Vehicle travel times improve slightly in concept A and get about 10% worse in Concept B.

Eastbound AM Peak Period
Travel Time Model Results by Timepoint

BUS TRAVEL TIMES	Length (mi)	2030 Business as Usual (min)	2030 Concept A Travel Time Change (min)	2030 Concept B Travel Time Change (min)
Van Dorn to Jordan	1.2	7	-1 ½	-2
Jordan to Wheeler	1.1	6	-2	-2
Wheeler to Roth	0.5	3 ½	-½	- ½
Roth to Callahan	0.8	3	0	0
Eastbound TOTAL	**3.6**	**19**	**- 4**	**- 4 ½**

PASSENGER CAR TRAVEL TIMES	Length (mi)	2030 Business as Usual (min)	2030 Concept A Travel Time Change (min)	2030 Concept B Travel Time Change (min
Van Dorn to Jordan	1.2	2	-½	-1 ½
Jordan to Wheeler	1.1	2 ½	0	0
Wheeler to Roth	0.5	2	-½	0
Roth to Callahan	0.8	4	0	0
Eastbound TOTAL	**3.6**	**10 ½**	**-1**	**-1 ½**

Travel Time Improvement* Compared to Business as Usual

Travel Time Deterioration* Compared to Business as Usual

*Totals and segments rounded to the nearest ½ minute. Icon next to 0 change indicates directionality prior to rounding.

- Bus travel time improvement is about 30 sec better in Concept B – more than 20% better for both.
- Vehicle travel times improve slightly more in Concept B, but improve in both.

Westbound AM Peak Period
Travel Time Model Results by Timepoint

BUS TRAVEL TIMES	Length (mi)	2030 Business as Usual (min)	2030 Concept A Travel Time Change (min)		2030 Concept B Travel Time Change (min)	
Callahan to Roth	0.8	5	- 2		1	
Roth to Wheeler	0.5	4	- 1		½	
Wheeler to Jordan	1.1	6	- 2 ½		- 2	
Jordan to Van Dorn	1.2	5.5	-1 ½		- 2	
Westbound TOTAL	**3.6**	**21**	**- 6 ½**		**- 5 ½**	

PASSENGER CAR TRAVEL TIMES	Length (mi)	2030 Business as Usual (min)	2030 Concept A Travel Time Change (min)		2030 Concept B Travel Time Change (min	
Callahan to Roth	1.2	4	1 ½		- ½	
Roth to Wheeler	1.1	2	½		0	
Wheeler to Jordan	0.5	3	0		½	
Jordan to Van Dorn	0.8	2	½		0	
Westbound TOTAL	**3.6**	**10 ½**	**2 ½**		**½**	

Travel Time Improvement* Compared to Business as Usual

Travel Time Deterioration* Compared to Business as Usual

*Totals and segments rounded to the nearest ½ minute. Icon next to 0 change indicates directionality prior to rounding.

- Bus travel time improvement is about 1 min. better in Concept A.
- Vehicle travel times get worse in both, but are worse in Concept A.
- Overall travel times are still several minutes better than PM.

Round Trip Travel Time Examples

If you **commute during the AM peak** and **return during the PM peak**, **you save**…

West End to Old Town

2 min (Concept A)
0 min (Concept B)

11 min (Concept A)
10 min (Concept B)

Old Town to West End

1.5 min (Concept A)
3.5 min (Concept B)

16 min (Concept A)
15 min (Concept B)

Jordan/Fox Chase to Old Town

2.5 min (Concept A)
0.5 min (Concept B)

9 min (Concept A)
6 min (Concept B)

Old Town to Jordan/Fox Chase

- 3.5 min (Concept A)
1.5 min (Concept B)

8 min (Concept A)
6.5 min (Concept B)

MODEL ASSUMPTIONS

Volumes

- Turning movement counts from 2018
- Supplemented by more recent data
- '2018' volumes converted to '2030' volumes by:
  - Adding traffic from developments (e.g. Landmark Mall)
  - Adding general traffic from regional growth based on historical data points
- If anything, the 2030 volumes are conservative since the base year of 2018 assumes pre-pandemic traffic volume and patterns, and because the model does not consider whether drivers would change their route decision making in the future.

Transit Stops

- Dwell times based on historic data, varied by major, minor, and BRT stops
- Bus stops along Duke Street consolidated (from about 20 per direction to 8)

Geometry changes (in all models, including No Build)

- West Taylor Run area proposed changes
  - Southbound vehicles on West Taylor Run Parkway prevented from accessing eastbound ramp to Telegraph Road (matches current pilot project conditions)
  - Added westbound slip lane from Duke Street onto service road
  - Reconfiguration of ramp connections between eastbound Duke Street and Telegraph Road
- Landmark Mall redevelopment proposed changes
  - 2 new intersections along Duke Street
  - New traffic signal at I-395 northbound off-ramp
  - Reconfiguration of ramp connections between Duke Street and Van Dorn Street

Signal Operations (general)

- While the 'Business as Usual' (i.e., the No Build) model shows signal timing improvements from today, the models for the two concepts have more refined signal timing plans. The concepts reflect how a corridor with BRT would be operated differently than without BRT, with priority given to the bus lanes/through traffic at the expense of the side streets. Hence, some of the travel time gains from the Concept models are due to this operational difference, and not inherently due to the infrastructure changes themselves.

GENERAL TALKING POINTS

Traffic Patterns

- The Duke Street corridor doesn't have traditional traffic volume patterns – there are many intersections with heavy turning volumes for some movements but minimal turning volume for other movements. This is due to a lack of options for drivers, with some roads leading nowhere, and a few roads being the only connections to certain destinations. For example, there are only two ways along the corridor to go south, Telegraph Road and Van Dorn Street, and these types of restrictions lead to funneling of traffic to certain points/junctions. The high amount of turns at several intersections in the corridor dictates overall congestion more than the number of vehicles travelling straight through the corridor.
  - Importantly, this is why we are able to reduce the number of travel lanes without major negative impacts to travel time on Duke Street.
  - This is also why the difference in the model results comes down to how turns are handled at intersections

Center Running Operations

- The center running bus lanes have different types of signal operations:
  - For most intersections, left turns are only permitted under a 'green arrow', and not a combination of 'green arrow' and 'green ball' (or flashing yellow arrow) left turns like they are today. This means that some more time needs to be dedicated to left turns compared to through traffic, which increases travel time for cars and buses in the corridor.
  - The center running lanes allow for two-staged pedestrian crossings (where peds would get a walk signal to get to the median, then wait a little bit to get another walk signal go finish crossing the street). This allows for some more efficient signal timings at certain intersections.
  - The center running lanes can require special accommodations where they start and stop to help get buses in and out of them. The intersections that have these accommodations need to dedicate some traffic signal time to them, thus reducing overall efficiency handling traffic in general.

Curb Running Operations

- The Curb running lanes can handle large volumes of right turns better, since those right turns can use the curb bus-only lanes.
- Generally, curb running lanes handle intersections with larger turns from Duke Street better (since right turns can use the bus lane, and they can use both 'green arrow' and 'green ball' types of left turns). While center running can handle intersections where side streets have large amounts of turning traffic better since they can use two-stage ped crossings.

DETAILED MODELING TALKING POINTS

West end of transitway (Reynolds Street/Ripley Street):

- VISSIM modeling was helpful in determining the optimal placement of the start and end points of the bus lanes in the vicinity of Van Dorn Street
- Modeling team went through multiple design iterations which balanced ease of movement for buses with limited delay for passenger vehicles.

Cambridge Road:

- Build concepts include improvements to the Cambridge Road intersection which reduce conflict between movements and improve operations.
- This is a complicated area with interactions between Duke Street, Cambridge Road, and the service road and differing volume patterns throughout the day (i.e., school traffic in AM peak)

W Taylor Run Parkway:

- Currently proposed background improvements near the W Taylor Run Parkway intersection would integrate well with the transitway.
- Improvements foster better multimodal connections, reduce potential conflicts, and improve traffic flow for the bus lanes if implemented.

MODEL LIMITATIONS

- The model is unable to factor in poor driver behavior like blocking of the bus lane or double-parking
- The model does not consider how drivers may choose to alter their routes in the future. For example, drivers may seek an alternate path for their commute in the future based on traffic congestion or reliability of travel time on the Duke Street corridor.
- The model does not consider any shifts in travel modes with the transitway improvements.