Madison BRT Transit Corridor Study Proposed BRT Travel Time Estimation Approach

This paper presents proposed methodology and estimates of bus rapid transit (BRT) travel times for use in the Madison BRT Transit Corridor Study. The objective is to develop reasonable estimates of BRT travel times, for use in travel demand modeling/ridership forecasts, fleet sizing and estimating daily and annual revenue bushours of service, for use in O&M cot estimation. Travel time components include:

- Time when the bus is in-motion, both in free flow and congested conditions;
- Time when the bus is stopped at a bus station to pick-up and drop-off passengers; and
- Time when the bus is stopped at traffic signals.

Proposed assumptions for each of these components are described in the following sections of this paper.

In-Motion Bus Times

In-motion bus time is a function of acceleration and deceleration from and to a stopped condition, and the average operating speed between accelerating and decelerating and driving distance, and traffic congestion. Acceleration and deceleration rates vary depending on the type of vehicle. Research literature suggests that acceleration rates typically are 2.0 to 2.5 mphps (decreasing when accelerating to speeds above 20 mph) and deceleration rates are typically 2.0 mphps. Acceleration rates for articulated buses are less than for standard 40' buses, and hybrid buses tend to have higher acceleration rates than diesel buses. Since vehicle type is yet undefined in this feasibility study, it is proposed that a 2.0 mphps acceleration rate be used (gradually decreasing to 1.25 mphps when accelerating to 40 mph), and a constant 2.0 mphps deceleration be used.

It is proposed that existing posted speed limits be used as the maximum allowable speed between stations. Table 1 presents posted speeds on road segments proposed for BRT service.

Maximum assumed operating speeds have been reduced in areas where there is known to be high levels of congestion. (e.g., University Avenue/Park Street area). Table 2 identifies areas where speeds lower than the posted speed limit have been assumed due to congestion. It is important to note that the calculated <u>average</u> speed between stations will be much lower than the maximum speed assumptions shown in Tables 1 and 2, once traffic signal delay and bus stops are taken into account.

			Posted Speed
Corridor	Street	From/To	(mph)
Central	Gorham/Johnson St.	State St. to Bassett St.	25
	Univ./Johnson St.	Bassett St. to Park St.	25
	State Street	Gorham/Johnson St. to Capitol Sq.	unknown
	Washiington Ave.	Capitol Sq. to Baldwin St.	35
East	Washington Ave.	Baldwin St. to Wright St.	35
	Wright St.	Washington Ave. to Anderson St.	25
	Anderson St.	Wright St. to Sloughton Rd.	35
	Sloughton Rd.	Anderson St. to Washington Ave.	35
	Washington Ave.	Sloughten St. to East Towne Mall	45
West	University/Johnson St.	Park St. to Campus Dr.	25
	Campus Dr.	University Ave. to University Ave.	40
	University Ave.	Campus Dr. to Segoe Rd.	35
	, Segoe Rd.	University Ave. to Sheboygan Ave.	30
	Sheboygan Ave.	Segoe Rd. to Whitney Way	30
	Whitney Way	Sheboygan Ave. to Mineral Point Rd.	30
	Mineral Point Rd.	Whiney Way to High Point Road	40
	Alt. Odana Rd. Alianme	ent	
	Whitney Way	Mineral Point Rd. to Tokav Blvd.	35
	Tokav Blvd.	Whitney Way to Odana Rd.	30
	, Odana Rd.	Tokay Blyd. to Gammon Rd.	30
	Gammon Rd.	Odana Rd. to West Towne Mall	35
North	Washington Ave	Baldwin St. to First St	35
North	Fordem Ave	Johnson St. to Sherman Ave	30
	Sherman Ave.	Fordem Ave. to Northport Dr.	30
South	Dark St	University Ave. to Persont St	35
South	Dark Ct	Regent St. to Redger Road	30
	Radger Rd	Dark St. to Eich Hatchery Rd	30
	Fish Hatchery Rd	Badger Rd to Post Rd	30
	Fish Hatchery Rd	Post Rd to Caddis Bend	30 40
	non national y ha.	r oschu, to cuulis bellu	TU

Table 1Posted Speed Limits on Proposed BRT Road Segments

BRT Road Degments With Reduced Max. Opeed Assumptions											
Corridor	Roadway	Segment	Reduced								
			Speed								
Central	Washington Ave.	Capitol Sq. to Webster St.	10 mph								
	Washington Ave.	Webster St. to Blair St.	25 mph								
	State Street/Gorham St.	Capitol Sq. to Bassett St.	10 mph								
	University Ave.	Bassett Street to Park St.	20 mph								
South	Park Street	Univ. Ave. to Regent St.	25 mph								
East	Anderson St.	Wright St. to Stoughton Rd.	25 mph								
West	Mineral Pt. Road	Yellow Stone Dr. to Westfield	30 mph								
		Rd.									
West	Odana Road	Grand Canyon Dr. to West	25 mph								
(Alt. Alignment)		Towne Mall									

Table 2BRT Road Segments With Reduced Max. Speed Assumptions

Bus Stop Dwell Times

The time spent at each stop is dependent on characteristics such as:

- The number of passengers boarding and alighting
- The number of doors available for boarding and alighting
- Passenger volumes inside the bus
- Fare collection method (i.e., on-board or off-board)
- ADA/wheelchair and bicycle boardings and alightings and procedures to accommodate them (e.g., kneeling, ramp deployment, securement procedures inside the bus, exterior bike racks)
- Proportion of trips that pass the stop without stopping

Although some lower use stops may be passed without stopping, travel time estimates for this study will assume buses come to a complete stop at each designated BRT station/stop. Off-board fare collection is assumed, thus allowing for the use of both bus doors for boarding activity and a uniform dwell time regardless of projected boardings, except for very high use stops.

It is recommended that stations be classified as "moderate" vs. "high" ridership activity, and that typical ridership activity stations are assigned an average station dwell of 15 seconds, and high ridership activity stations are assigned an average station dwell of 30 seconds. Although actual dwell times can sometimes be lower, these values provide some allowance for the potential presence of bicycle users, ramp deployments, and other unpredictable events. It is also proposed that stops at existing or proposed relocated transfer points are assigned a higher dwell time. Additional dwell time assumptions are as follows:

- One-minute dwells have been proposed at the relocated North Transfer Point at Aberg for the North Corridor Alignment
- One-minute dwells are proposed at the East Towne Mall Station for the East Corridor Alignment

- Two-minute dwells are proposed at the South Transfer Point for the South Corridor Alignment (to allow some time for buses to turn into/out of the transit center)
- Two-minute dwells are proposed at the West Transfer Point for the West Corridor Alignment – Odana Road alternative (to allow some time for buses to turn into/out of the transit center)
- Two-minute dwells are also assumed at Mineral Point Road Station for the West Corridor Alignment Mineral Point Road alternative. It is assumed the West Transfer Point is relocated to this location under this scenario.

Table 3 presents a list of proposed BRT stops and proposed station classifications for each proposed corridor. Stations in Table 3 that have been assigned 30-second station dwells are at locations where there is a nearby major trip generator.

			Station	Station
Corridor	Station ID	Station Name	Class.	Dwell
Central	C400w	Park Street	High	0:00:30
	C300w	Bassett Street	High	0:00:30
	C200w	State Street	High	0:00:30
	C100	Capitol Square	High	0:00:30
	C200e	Webster Street	Moderate	0:00:15
	C300e	Blair Street	Moderate	0:00:15
	C400e	Paterson Street	Moderate	0:00:15
	C500e	Baldwin Street	Moderate	0:00:15
East	E100	First Street	Moderate	0:00:15
	E200	Fourth Street	High	0:00:30
	E300	Milwaukee Street	Moderate	0:00:15
	E400	Starkweather Creek	Moderate	0:00:15
	E500	Melvin Court	Moderate	0:00:15
	E600	Wright Street	Moderate	0:00:15
	E700	Madison College	High	0:00:30
	E800	Mendota Street	Moderate	0:00:15
	E900	Thierer Road	Moderate	0:00:15
	E1000	East Towne Mall	High	0:01:00
West	W100	Mills/Charter Street	High	0:00:30
	W200	Randall Avenue	Hiah	0:00:30
	W300	Farley Avenue	Moderate	0:00:15
	W400	Shorewood Boulevard	Moderate	0:00:15
	W500	Midvale Boulevard	Moderate	0:00:15
	W600	Sheboyaan Avenue	Moderate	0:00:15
	W700	Eau Claire Avenue	Moderate	0:00:15
	W800	Regent Street	Moderate	0:00:15
	W900a	Mineral Point Road (MPR align)	Hiah	0:02:00
	W900b	Mineral Point Rod (Odana Rd align)	Moderate	0.00.12
	W1000	Rosa Road	Moderate	0:00:15
	W1100	Yellow Stone Drive	Moderate	0:00:15
	W1200	Westfield Road	High	0.00.30
	W1300	High Point	High	0.00.30
	W1000A	West Transfer Point	High	0.02.00
	W/1100A	Research Park Boulevard	Moderate	0:00:15
	W/1200A	Grand Canvon Drive	Moderate	0:00:15
	W/1300A	West Towne Mall	High	0.00:30
North	N100	Sherman Terrace	Moderate	0:00:15
Horai	N200	Commercial Avenue	Moderate	0:00:15
	N300	Aberg	High	0:01:00
	N400	Vahlen Street	Moderate	0:00:15
	N500	Trailsway	Moderate	0:00:15
	N600	Warner Park	High	0:00:30
South	<u></u>	Regent Street	Moderate	0:00:15
- Coddi	\$200	W Washington Avenue	Moderate	0:00:15
	\$300	Frin Street	Moderate	0:00:15
	S400		Moderate	0:00:15
	5500	Wingra Creek	Moderate	0.00.15
	5600	Prom Street	Moderate	0:00:15
	0000 0700	Villager Mall	Moderate	0.00.10
	3700	villaget ividii South Transfor Deint		0.00.10
	2000	Souur Hansler Point Dedger Deed	riign Moderat-	0.02.00
	5900		Noderate	0.00.45
	51000		woderate	0.00115
	51100	Post Road	Moderate	0:00:15
	S1200	Caddis Bend	Moderate	0:00:15

 Table 3

 BRT Station/Stop Designations and Dwell Times

Stations highlighted reflect alternative West Corridor alignment that is under consideration.

Traffic Signal Delay

The next component of BRT travel times is time spent in a stop condition at traffic signals. Traffic signal delay will vary considerably, for characteristics such as cycle time, phasing and signal progression will influence the probability that a bus arrives at a signal during the red phase of the cycle. Locations and length of delay will also vary by bus trip. Since this is a feasibility study, it is appropriate to define global assumptions regarding traffic signal characteristics, to calculate an <u>average</u> delay for each signalized intersection (recognizing that buses will not incur this delay at each signalized intersection).

The City of Madison Traffic Engineering Division provided cycle length information for each signalized intersection along the proposed BRT corridors, shown in Table 3. Actual cycle lengths in the p.m. peak period typically range from 80 to 110 seconds, with a majority of signals exhibiting a 90 second cycle length. For signals where there is a range in potential cycle length, the maximum length has been used. For signals where there is no specified cycle length, a 90 second cycle time has been assumed, with the exception of Stoughton Road and Anderson Street, where a 120 second cycle time has been used.

The Traffic Engineering Division also provided typical green time splits for the major arterial through movement for select intersections. Green time splits typically ranged from 70 to 80 percent for the through movements. Green time splits around Capitol Square, however, were much less. In addition, there are several locations along proposed BRT alignments where buses will be turning left onto other streets, resulting in additional delay time for the bus. For purposes of this feasibility study, typical green time assumptions, as a percentage of the cycle time, are as follows:

- Arterial through movements 75%
- Downtown and University area 50%
- Non-downtown right turn movements 75%
- Non-downtown left turn movements 25%

The next element in calculating traffic signal delay is consideration for transit signal prioritization (TSP). The Traffic Engineering Division has indicated that pedestrian timing provided for crossing the major street exceeds the programmed side street splits, and therefore, it may not be possible to provide TSP at many intersections. For purposes of this study, TSP has only been assumed at signalized intersections in suburban areas, where the volume of pedestrian crossings are likely to be low. Areas designated as outlying areas with potential for TSP along each alignment are as follows:

- East Corridor east of First Street, but not including intersections near Madison College
- West Corridor south/west of Sheboygan Avenue/Whitney Way
- North Corridor North of Johnson Street
- South Corridor South of Badger Road/Fish Hatchery Road

A 10 percent extension of green time has been assumed at those intersections where TSP has been assumed. This results in an extra 7 seconds of green time for a 90 second cycle with 75% green time for the arterial through movement.

Finally, consideration was given to signal progression. This has been expressed as the probability that a bus is stopped at a signalized intersection. For arterial through movements, a 25% stop probability has been assumed (i.e., a bus could be stopped for the full red phase of a cycle one of every four signalized intersections). For the downtown and University area, a 33% delay probability has been assumed. For intersections where the bus must make a left turn, a 50% delay probability has been assumed.

Buses are also required to stop at all railroad crossings. Travel time estimates take into account the time to decelerate to a complete stop, and then accelerate at each of the following railroad crossings:

Table 4 presents resulting calculations of average signal delay at each signalized intersection and railroad crossing along proposed BRT alignments. Some delay has also been assumed at stop signs. It is important to note that this table is intended to reflect reasonable assumptions of traffic signal delay along each BRT alignment, and not anticipated actual delay, and that assumptions such as intersections with TSP will require much further analysis.

Travel Time Results

Tables 5 through 9 present resulting travel time estimates for each of the four corridors, including portions of the Central Corridor from Capitol Square. The travel time estimates follow the methodology described in this paper, and are based on the following formula for each station-to-station segment:

Total Travel Time = bus time in motion (including acceleration and deceleration to the maximum defined speed) + traffic signal delay time + station dwell time

Travel time estimates have only been calculated for one direction (outbound from downtown Madison). Travel times for the reverse direction are assumed to be similar. Layover/recovery time will be included in bus cycle time calculations that will account for potential variations. Run time (in-motion time) ranges from 57 to 66 percent of total travel time for all corridors.

Travel time estimates shown in the following tables do not specifically account for potential travel time differences on alignment segments where mixed runningway conditions are proposed. For example, on Whitney Way and Mineral Point Road (West Corridor), there are two alternative alignment configurations still under consideration – side running and median busway. Similarly, segments of the south corridor's proposed alignment include options of a side running vs. median busway configuration. A median busway configuration would separate bus traffic from general vehicular traffic, and thus provide more reliable bus travel times. It may also provide slightly faster bus travel times, depending on the level of congestion in the general traffic lanes.

	Т	able 4	Ļ
Traffic	Signal	Delay	Calculations

	Seg.			Actu	al Cycle L	enths.		% Green		Max.	Max.	Prob.	Avg.
Corridor	ID	Intersection		AM PK	Off Pk	PM Pk	USE	Time	TSP?	Green Time	Red Time	of Delay	Delay
-													
Central	C20w	Mifflin St.	Wisconsin Ave.	80	65	80	0:01:20	50%	No	0:00:40	0:00:40	33%	0:00:13
	C20w	Mifflin St.	Carroll St./State St. (RT)	80	65	80	0:01:20	50%	No	0:00:40	0:00:40	33%	0:00:13
	C20w	State St.	W. Dayton St.	80	65	80	0:01:20	50%	No	0:00:40	0:00:40	33%	0:00:13
	C30w	State Street	Johnson St.	90/100	80	90/100	0:01:40	50%	No	0:00:50	0:00:50	33%	0:00:17
	C30w	State Street	Gorham St. (LT)	90/100	80	90/100	0:01:40	50%	No	0:00:50	0:00:50	33%	0:00:17
	C30w	Gorham St.	N. Broom St.	90/100	80	90/100	0:01:40	50%	No	0:00:50	0:00:50	33%	0:00:17
	C30w	University Ave.	N. Frances St.	90/100	80	90/100	0:01:40	50%	No	0:00:50	0:00:50	33%	0:00:17
	C40w	University Ave.	N. Lake St.	90/100	80	90/100	0:01:40	50%	No	0:00:50	0:00:50	33%	0:00:17
	C40w	University Ave.	Campus Mall	90/100	80	90/100	0:01:40	50%	No	0:00:50	0:00:50	33%	0:00:17
	C40w	University Ave.	Park St. (LT)	90/100	80	90/100	0:01:40	50%	No	0:00:50	0:00:50	33%	0:00:17
	C20e	Main Street	Martin Luther King Blvd., Jr.	80	65	80	0:01:20	50%	No	0:00:40	0:00:40	33%	0:00:13
	C20e	Main Street	Pinckney Street/King Street (LT)	80	65	80	0:01:20	50%	No	0:00:40	0:00:40	33%	0:00:13
	C20e	Picnkney St.	Washington Ave. (RT)	80	65	80	0:01:20	50%	No	0:00:40	0:00:40	33%	0:00:13
	C20e	Washington Ave.	Webster St.	80	65	80	0:01:20	50%	No	0:00:40	0:00:40	33%	0:00:13
	C30e	Washington Ave.	Blair St.	90/100	80	90/100	0:01:40	75%	No	0:01:15	0:00:25	25%	0:00:06
South	S50	University Ave.	Paik St. (LT)	90/100	80	90/100	0:01:40	50%	No	0:00:50	0:00:50	33%	0:00:17
	S50	Park St.	W. Johnson St.	90/100	80	90/100	0:01:40	50%	No	0:00:50	0:00:50	33%	0:00:17
	S50	Park Street	W. Dayton St.	95	85	90	0:01:30	75%	No	0:01:07	0:00:23	25%	0:00:06
	S50	Park Street	Regent St.	95	85	90	0:01:30	75%	No	0:01:07	0:00:23	25%	0:00:06
	S60	Park Street	Braxton Place	95	85	90	0:01:30	75%	No	0:01:07	0:00:23	25%	0:00:06
	S60	Park Street	W. Washington Ave.	95	85	90	0:01:30	75%	No	0:01:07	0:00:23	25%	0:00:06
	S70	Park Street	Enin St.	95	85	90	0:01:30	75%	No	0:01:07	0:00:23	25%	0:00:06
	S80	Park Street	Fish Hatchery Road	95	85	90	0:01:30	75%	No	0:01:07	0:00:23	25%	0:00:06
	S80	Park Street	W. Olin Ave.	95	85	90	0:01:30	75%	No	0:01:07	0:00:23	25%	0:00:06
	S90	Park Street	W. Wingra Dr.	95	85	90	0:01:30	75%	No	0:01:07	0:00:23	25%	0:00:06
	S100	Park Street	Plaenert Dr.	95	85	90	0:01:30	75%	No	0:01:07	0:00:23	25%	0:00:06
	S100	Park Street	Rairoad Crossing	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0:00:10
	S110	Park Street	Buick St.	95	85	90	0:01:30	75%	No	0:01:07	0:00:23	25%	0:00:06
	S120	Park Street	Hughes Place	95	85	90	0:01:30	75%	No	0:01:07	0:00:23	25%	0:00:06
	S120	Park Street	Badger Road (RT)	95	85	90	0:01:30	75%	No	0:01:07	0:00:23	25%	0:00:06
	S130	W. Badger Road	Fish Hatchery Road (LT)	90	80	90/100	0:01:40	25%	No	0:00:25	0:01:15	50%	0:00:38
	S140	Fish Hatchery Road	Ann St/Emil St.	90	80	90/100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	S140	Fish Hatchery Road	Beltine WB Ramps	90	80	90/100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	S140	Fish Hatchery Road	Bettine EB Ramps	90	80	90/100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	S140	Fish Hatchery Road	Greenway Cross	90	80	90/100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	S150	Fish Hatchery Road	Post Road	90	80	90/100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	S160	Fish Hatchery Road	High Ridge Trail (RT)	n/a	n/a	n/a	Stop	n/a	n/a	n/a	n/a	n/a	0:00:10
	S160	Cahill Main	Caddis Bend	n/a	n/a	n/a	Stop	n/a	n/a	n/a	n/a	n/a	0:00:10
	S160	Caddis Bend	Fish Hatchery Road (LT)	90	80	90/100	0:01:40	25%	Yes	0:00:28	0:01:13	50%	0:00:36

Table 4 (Continued) Traffic Signal Delay Calculations

	Seg.			Actua	al Cycle L	enths		% Green		Max.	Max.	Prob.	Avg.
Corridor	ID	Intersection		AM PK	Off Pk	PM Pk	USE	Time	TSP?	Green Time	Red Time	of Delay	Delay
										-			
North	N20	Main Street	Martin Luther King Blvd., Jr.	80	65	80	0:01:20	50%	No	0:00:40	0:00:40	33%	0:00:13
	N20	Main Street	Pinckney Street/King Street (LT)	80	65	80	0:01:20	50%	No	0:00:40	0:00:40	33%	0:00:13
	N20	Pinckney St.	Washington Ave. (RT)	80	65	80	0:01:20	50%	No	0:00:40	0:00:40	33%	0:00:13
	N20	Washington Ave.	Webster St.	80	65	80	0:01:20	50%	No	0:00:40	0:00:40	33%	0:00:13
	N30	Washington Ave.	Blair St.	90/100	80	90/100	0:01:40	75%	No	0:01:15	0:00:25	25%	0:00:06
	N40	Washington Ave.	Paterson St.	90/100	80	90/100	0:01:40	75%	No	0:01:15	0:00:25	25%	0:00:06
	N50	Washington Ave.	Ingersoll St.	90/100	80	90/100	0:01:40	75%	No	0:01:15	0:00:25	25%	0:00:06
	N50	Washington Ave.	Baldwin St.	90/100	80	90/100	0:01:40	75%	No	0:01:15	0:00:25	25%	0:00:06
	N60	Washington Ave.	Busway Connection (LT)	60	60	60	0:01:40	25%	No	0:00:25	0:01:15	50%	0:00:38
	N60	Busway Connection	Johnson Street	60	60	60	0:01:40	50%	No	0:00:50	0:00:50	33%	0:00:17
	N70	Sherman Ave.	Commercial Ave.	FREE			0:01:30	70%	Yes	0:01:09	0:00:21	33%	0:00:07
	N80	Sherman Ave.	Railroad Crossing	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0:00:10
	N80	Sherman Ave.	Aberg Ave.	FREE			0:01:30	70%	Yes	0:01:09	0:00:21	33%	0:00:07
	N90	Sherman Ave.	Schlingen Ave.	FREE			0:01:30	70%	Yes	0:01:09	0:00:21	33%	0:00:07
-													
East	E20	Main Street	Martin Luther King Blvd., Jr.	80	65	80	0:01:20	50%	No	0:00:40	0:00:40	33%	0:00:13
	E20	Main Street	Pinckney Street/King Street (LT)	80	65	80	0:01:20	50%	No	0:00:40	0:00:40	33%	0:00:13
	E20	Pinckney St.	Washington Ave. (RT)	80	65	80	0:01:20	50%	No	0:00:40	0:00:40	33%	0:00:13
	E20	Washington Ave.	Webster St.	80	65	80	0:01:20	50%	No	0:00:40	0:00:40	33%	0:00:13
	E30	Washington Ave.	Blair St.	90/100	80	90/100	0:01:40	75%	No	0:01:15	0:00:25	25%	0:00:06
	E40	Washington Ave.	Paterson St.	90/100	80	90/100	0:01:40	75%	No	0:01:15	0:00:25	25%	0:00:06
	E50	Washington Ave.	Ingersoll St.	90/100	80	90/100	0:01:40	75%	No	0:01:15	0:00:25	25%	0:00:06
	E50	Washington Ave.	Baldwin St.	90/100	80	90/100	0:01:40	75%	No	0:01:15	0:00:25	25%	0:00:06
	E60	Washington Ave.	RR Crossing #1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0:00:10
	E60	Washington Ave.	RR Crossing #2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0:00:10
	E60	Washington Ave.	First Street	90/100	80	90/100	0:01:40	75%	No	0:01:15	0:00:25	25%	0:00:06
	E70	Washington Ave.	4th Street	90/100	80	90/100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	E80	Washington Ave.	North St.Miwaukee St.	90/100	80	90/100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	E90	Washington Ave.	Johnson St.	90/100	80	90/100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	E90	Washington Ave.	N. Marquette	90/100	80	90/100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	E100	Washington Ave.	Aberg Ave. SB Ramps	90/100	80	90/100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	E100	Washington Ave.	Aberg Ave. NB Ramps	90/100	80	90/100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	E120	Washington Ave.	Wright St. (LT)	90/100	80	90/100	0:01:40	25%	No	0:00:25	0:01:15	50%	0:00:38
	E120	Wright St.	Anderson St. (RT)	FREE			0:01:30	75%	No	0:01:07	0.00.23	25%	0.00.06
	F130	Anderson St	Stoughton Road (RT)	FREE			0.02.00	75%	No	0.01.30	0.00.30	25%	0.00.08
	E130	Stoughton Road	Washington Ave. (LT)	FREE			0:01:30	25%	No	0:00:23	0:01:07	50%	0:00:34
	F130	Washington Ave	Mendota St	90	90	100	0:01:40	75%	Yes	0.01.23	0.00-17	25%	0.00.04
	E140	Washington Ave	Lien Road	90	90	100	0:01:40	75%	Yes	0:01:23	0.00.17	25%	0.00.04
	F140	Washington Ave	Thierer Road/Portage Road	90	90	100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	E150	Washington Ave	Eagan Road (RT)	90	90	100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	E150	Eagan Road	E. Towne Blvd. (LT)	n/a	n/a	n/a	Stop	n/a	n/a	n/a	n/a	n/a	0:00:10

Table 4 (Continued) Traffic Signal Delay Calculations

	Seg.			Actua	al Cycle L	enths		% Green		Max.	Max.	Prob.	Avg.
Corridor	ID	Intersection		AM PK	Off Pk	PM Pk	USE	Time	TSP?	Green Time	Red Time	of Delay	Delay
West	W50	University Ave.	Park St.	90/100	80	90/100	0:01:40	50%	No	0:00:50	0:00:50	33%	0:00:17
	W50	University Ave.	N. Brooks St.	90/100	80	90/100	0:01:40	50%	No	0:00:50	0:00:50	33%	0:00:17
	W50	University Ave.	N. Mils St.	90/100	80	90/100	0:01:40	50%	No	0:00:50	0:00:50	33%	0:00:17
	W60	University Ave.	N. Charter St.	90/100	80	90/100	0:01:40	50%	No	0:00:50	0:00:50	33%	0:00:17
	W60	University Ave.	N. Orchard St.	90/100	80	90/100	0:01:40	50%	No	0:00:50	0:00:50	33%	0:00:17
	W70	University Ave.	N. Randall Ave.	90/100	80	90/100	0:01:40	50%	No	0:00:50	0:00:50	33%	0:00:17
	W70	University Ave.	RR Xing/Ped Xing	90/100	80	90/100	0:01:40	50%	No	0:00:50	0:00:50	33%	0:00:17
	W70	University Ave.	Campus Drive	90/100	80	90/100	0:01:40	50%	No	0:00:50	0:00:50	33%	0:00:17
	W80	University Ave.	Farley Ave.	100/115	85	100	0:01:40	75%	No	0:01:15	0:00:25	25%	0:00:06
	W80	University Ave.	Ridge Street	100/115	85	100	0:01:40	75%	No	0:01:15	0:00:25	25%	0:00:06
	W90	University Ave.	Shorewood Blvd.	100/115	85	100	0:01:40	75%	No	0:01:15	0:00:25	25%	0:00:06
	W100	University Ave.	Midvale Blvd.	100/115	85	100	0:01:40	75%	No	0:01:15	0:00:25	25%	0:00:06
	W100	University Ave.	Segoe Road (LT)	100/115	85	100	0:01:40	25%	No	0:00:25	0:01:15	50%	0:00:38
	W100	Segoe Road	Frey Road	100/115	85	100	0:01:40	75%	No	0:01:15	0:00:25	25%	0:00:06
	W100	Segoe Road	Sheboygan Ave. (future signal RT)	FREE			0:01:30	75%	No	0:01:07	0:00:23	25%	0:00:06
	W120	Sheboygan Ave.	Whitney Way (future signal LT)	FREE			0:01:30	25%	No	0:00:23	0:01:07	50%	0:00:34
	W120	Whitney Way	Regent St.	FREE			0:01:30	75%	Yes	0:01:14	0:00:16	25%	0:00:04
	W130	Whitney Way	Mineral Point Road (RT)	95	90	100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	W140	Mineral Point Road	Rosa Rd.	95	90	100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	W150	Mineral Point Road	Island Dr.	95	90	100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	W160	Mineral Point Road	Yellowstone Dr.(future signal)	1 95	90	100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	W160	Mineral Point Road	Grand Canyon Dr.	95	90	100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	W160	Mineral Point Road	Gammon Road	FREE			0:01:30	50%	Yes	0:00:49	0:00:41	33%	0:00:13
	W160	Mineral Point Road	Mall Entrance (LT)	n/a	n/a	n/a	Stop	n/a	n/a	n/a	n/a	n/a	0:00:30
	W170	Westfield Road	Mineral Point Road (LT)	95	90	100	0:01:40	25%	Yes	0:00:28	0:01:13	50%	0:00:36
	W170	Mineral Point Road	Randolph Drive	95	90	100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	W170	Gammon Road	High Point Road	95	90	100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
-													
West	W140a	Whitney Way	Mineral Point Road	95	90	100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
Odana Road	W140a	Whitney Way	Tokay Blvd. (RT)	95	90	100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
Alignment	W180a	Tokay Blvd.	Odana Road (RT)	95	90	100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	W180a	Odana Road	Research Park Blvd.	95	90	100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	W190a	Odana Road	Potomac Lane	95	90	100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	W200a	Odana Road	Grand Canyon Drive	95	90	100	0:01:40	75%	Yes	0:01:23	0:00:17	25%	0:00:04
	W200a	Odana Road	Gammon Road	95	90	100	0:01:40	50%	Yes	0:00:55	0:00:45	33%	0:00:15
	W200a	Odana Road	Mall Ring Road (RT)	n/a	n/a	n/a	Stop	n/a	n/a	n/a	n/a	n/a	0:00:10

					innate		
	Max Spd.	Distanc	e Total	Run Time	Delay Time	Dwell Time	Total Time
Station	[mph]	[mi]	Distance	(hr:min:sec)	(hr:min:sec)	(hr:min:sec)	(hr:min:sec)
Capitol Square		_	0.00			0:00:00	0:00:00
	10	0.28		0:01:44	0:00:53		
Webster Street	or.	• • • •	0.28	0.00.44	0.00.00	0:00:15	0:02:52
Diain Ofricat	ZS	• 0.22	0.50	0.00.44	0:00:06	0.00.45	0.02.57
Blair Street	25	0.40	0.50	0:01:00	0-00-06	0.00.15	0.03.57
Pataroon Street	35	0.40	0.90	0.01.00	0.00.00	0.00.15	0.05.10
	25	0.50	0.09	0-01-10	0:00:12	0.00.15	0.05.16
Baldwin Street		0.0	1 30	0.01.10	0.00.12	0.00.15	0.06.56
Dardwin Street	35	0.46	1.55	0:01:06	0:00:26	0.00.15	0.00.00
First Street		0.40	1.86	0.01.00	0.00.20	0:00:15	0.08.43
The output	35	0.38	1.00	0:00:58	0:00:04	0.00.10	0.00.40
Fourth Street	00	0.00	2.24	0.00.00	0.00.01	0:00:30	0:10:15
	35	0 41		0.01.01	0:00:04		
Milwaukee Street			2.65			0:00:15	0:11:36
	35	0.46		0:01:06	0:00:09		
Starkweather Creek			3.11			0:00:15	0:13:06
	35	0.47		0:01:06	0:00:09		
Melvin Court			3.58			0:00:15	0:14:35
	35	0.37		0:00:57	0:00:00		
Wright Street			3.95			0:00:15	0:15:47
	25	0.49		0:01:23	0:00:43		
Madison College			4.44			0:00:30	0:18:23
	25	0.80		0:02:08	0:00:46		
Mendota Street			5.24			0:00:15	0:21:32
	40	0.47		0:01:04	0:00:09		
Thierer Road		_	5.70			0:00:15	0:23:00
	- 30	0.58		0:01:25	0:00:14		
East Towne Mall			6.28			0:01:00	0:25:39
- / /							
lotais			6.28	0:16:52	0:04:02	0:04:45	0:25:39
						Avg. Speed (mph):	14.69

Table 5East Corridor Travel Time Estimate

Table 6North Corridor Travel Time Estimate

	Max Spd.	Distance	Total	Run Time	Delay Time	Dwell Time	Total Time
Station	[mph]	[mi]	Distance	(hr:min:sec)	(hr:min:sec)	(hr:min:sec)	(hr:min:sec)
Capitol Square			0.00			0:00:00	0:00:00
	10	0.28		0:01:44	0:00:53		
Webster Street		_	0.28			0:00:15	0:02:52
	25	0.22		0:00:44	0:00:06		
Blair Street			0.50			0:00:15	0:03:57
	35	0.40		0:01:00	0:00:06		
Paterson Street			0.89			0:00:15	0:05:18
	35	0.50		0:01:10	0:00:12		
Baldwin Street			1.39			0:00:15	0:06:56
	30	0.60		0:01:27	0:00:54		
Sherman Terrace			1.99			0:00:15	0:09:32
	30	0.79		0:01:50	0:00:07		
Commercial Avenue			2.78			0:00:15	0:11:44
	30	0.50		0:01:15	0:00:17		
Aberg			3.28			0:01:00	0:14:15
	30	0.55		0:01:21	0:00:07		
Vahlen Street			3.83			0:00:15	0:15:58
	30	0.27		0:00:48	0:00:00		
Trailsway			4.10			0:00:15	0:17:01
	30	0.21		0:00:40	0:00:00		
Warner Park			4.31			0:00:30	0:18:11
Totals			4.31	0:11:59	0:02:42	0:03:30	0:18:11

	ooutin	oomu			linale		
	Max Spd.	Distance	e Total	Run Time	Delay Time	Dwell Time	Total Time
Station	[mph]	[mi]	Distance	(hr:min:sec)	(hr:min:sec)	(hr:min:sec)	(hr:min:sec)
Capitol Square	_		0.00			0.00.00	0.00.00
Capitor Square	10	0.17	0.00	0.01.06	0:00:40	0.00.00	0.00.00
State Street	10	0.17	0 17	0.01.00	0.00.40	0.00.30	0.02.16
	10	1 0 33	0.17	0.02.04	0:01:06	0.00.00	0.02.10
Bassett Street	10	0.00	0.50	0.02.01	0.01.00	0.00.30	0:05:56
	20	0.36	0.00	0:01:15	0:00:50		0.00.00
Park Street			0.86			0:00:30	0:08:30
	25	10.38		0:01:08	0:00:44		
Regent Street			1.24			0:00:15	0:10:37
-	30	0.31		0:00:53	0:00:11		
W. Washington Avenue			1.55			0:00:15	0:11:57
	30	0.23		0:00:43	0:00:06		
Erin Street			1.78			0:00:15	0:13:00
	30	0.46		0:01:11	0:00:11		
W. Olin Avenue			2.24			0:00:15	0:14:37
	30	0.37		0:01:00	0:00:06		
Wingra Creek			2.61			0:00:15	0:15:58
	30	0.22		0:00:42	0:00:16		
Bram Street			2.83			0:00:15	0:17:11
	30	0.28	• * *	0:00:49	0:00:06		
Villager Mall	AF.	0.05	3.11	0.00.40	0.00.44	0:00:15	0:18:20
On with Transfer Dalat	25	0.25	2.20	0.00.49	0:00:11	0.00.00	0.04.04
South Transfer Point	20	0.45	3.30	0.01.00	0-00-20	0:02:00	0:21:21
Dedway Dead	-30	0.45	2.04	0.01.09	0.00.38	0.00.45	0.02.00
Bauger Road	20	0.59	3.61	0-01-25	0-00-17	0.00.15	0.23.22
Greenway Cross	- 50	0.00	4 30	0.012.0	0.00.17	0.00.15	0.25.20
Greenway Cross	30	0.30	4.55	0.01.02	0:00:04	0.00.15	0.23.20
Post Road		0.55	478	0.01.02	0.00.04	0:00:15	0.26.41
- oothoud	40	0.72	4.10	0:01:27	0:00:56	0.00.10	0.20.41
Caddis Bend		5.1L	5,50	0.0111	0.00.00	0:00:15	0:29:19
Totals			5.50	0:16:43	0:06:21	0:06:15	0:29:19
						Avg. Speed (mph):	11.25

Table 7South Corridor Travel Time Estimate

Table 8

Max Spd. Station Distance (mr.min.sec) Total (mr.min.sec) Run Time (mr.min.sec) Delay Time (mr.min.sec) Duel Time (mr.min.sec) Total Time (mr.min.sec) Capitol Square 10 0.17 0.00 0.01.06 0.00.40 0.00.00 0.00.00 State Street 10 0.37 0.17 0.02.04 0.01.06 0.00.30 0.02.16 Bassett Street 10 0.33 0.60 0.01.15 0.00.30 0.05.56 Park Street 20 0.36 0.00.42 0.00.30 0.01.32 Mills/Charter Street 25 0.16 0.00.36 0.00.33 0.11.12 Mills/Charter Street 30 0.52 0.01.12 0.00.12 0.00.15 0.15.31 Shorewood Boulevard 35 0.52 0.01.11 0.00.50 0.00.15 0.13.29 Sheboygan Avenue 36 0.52 0.01.12 0.00.03 0.00.15 0.20.50 Eau Claire Avenue 30 0.55 5.77 0.01.21 0.00.04 0.20.51 0.22.50 <th>West Corridor 1</th> <th>Travel Ti</th> <th>me Es</th> <th>timate</th> <th>– Mineral I</th> <th>Point Roa</th> <th>ad Alignme</th> <th>nt</th>	West Corridor 1	Travel Ti	me Es	timate	– Mineral I	Point Roa	ad Alignme	nt
Station [mph] [mi] Distance (hr.min:sec) (hr.min		Max Spd.	Distance	Total	Run Time	Delay Time	Dwell Time	Total Time
Capitol Square 0.00 0.017 0.00 0.00.00 0.00.00 State Street 0.33 0.0106 0.00.40 0.00.30 0.02.16 Bassett Street 0.33 0.02.04 0.01.06 0.00.30 0.02.16 Park Street 0.36 0.01.15 0.00.50 0.00.30 0.08.30 Mills/Charter Street 30 0.22 0.00.42 0.00.30 0.00.30 0.10.32 Randall Avenue 124 0.00.16 0.00.30 0.17.11 0.00.30 0.17.21 Farley Avenue 25 0.16 0.00.30 0.00.15 0.15.31 Shorewood Boulevard 32 0.37 0.00.57 0.00.6 0.17.11 Midvale Boulevard 30 0.46 0.01.12 0.00.15 0.13.29 Sheboygan Avenue 30 0.55 0.00.38 0.00.15 0.22.03 Sage of Street 30 0.55 0.0121 0.00.38 0.00.15 0.22.03 Regent Street 5.32 0.0121 <	Station	[mph]	[mi]	Distance	(hr:min:sec)	(hr:min:sec)	(hr:min:sec)	(hr:min:sec)
State Street 0.17 0.0106 0.00.40 Bassett Street 0.33 0.50 0.0030 0.02:16 Bassett Street 0.33 0.50 0.00106 0.0030 0.05:56 Park Street 0.06 0.00115 0.00:30 0.06:30 0.00:30 0.06:30 Mills/Charter Street 0.00 0.00 0.0030 0.10:32 0.0030 0.10:32 Randall Avenue 1.24 0.0036 0.00.50 0.00:30 0.12:11 Farley Avenue 25 0.16 0.00:12 0.00:15 0.15:31 Shorewood Boulevard 35 0.37 0.00:57 0.00:015 0.17:11 Midvale Boulevard 35 0.37 0.00:57 0.00:15 0.18:29 Sheboygan Avenue 30 0.46 30 0.00:15 0.22:03 Sheboygan Avenue 30 0.55 0.01:23 0.00:15 0.22:03 Sheboygan Avenue 35 0.01:23 0.00:15 0.22:03 0.22:03 Sheb	Capitol Square			0.00			0:00:00	0:00:00
State Street 10 0.17 0.02 04 0.0106 Bassett Street 0.33 0.02 04 0.0106 0:00:30 0:05:56 Park Street 0.36 0.0115 0:00:50 0:00:30 0:08:30 Park Street 0.30 0.22 0.0012 0:00:30 0:08:30 Mills/Charter Street 1.08 0:00:36 0:00:30 0:10:32 Randail Avenue 1.24 0:00:36 0:00:30 0:12:11 Farley Avenue 2.50 0.0112 0:00:15 0:15:31 Shorewood Boulevard 35 0.37 0.0057 0:00:05 0:17:11 Midvale Boulevard 35 0.36 0:00:77 0:00:15 0:17:11 Midvale Boulevard 30 0.46 0:0111 0:00:15 0:20:50 Sheboygan Avenue 30 0.56 0:00:15 0:20:50 0:20:50 Baue Street 40 0.69 0:0121 0:00:15 0:22:03 Sis 0.31 0:00:16 0:20:15		10	0.17		0:01:06	0:00:40		
Ho 3.33 0.20 4 0.01.05 0.00.30 0.05.56 Park Street 0.86 0.00.42 0.00.50 0.00.30 0.08:30 Mills/Charter Street 30 0.22 0.00.42 0.00.50 0.00.33 0.00.33 Randall Avenue 25 0.16 0.00.36 0.00.30 0.12:11 Farley Avenue 124 0.00.36 0.00.12 0.00.15 0.15:31 Shorewood Boulevard 35 0.52 0.01.12 0.00.12 0.00.15 0.15:31 Mildvide Boulevard 35 0.37 0.00.57 0.00.16 0.17:11 Midvide Boulevard 3.39 0.00.58 0.00.15 0.18:29 Sheboygan Avenue 3.39 0.00.56 0.00.15 0.18:29 Sheboygan Avenue 3.00 0.36 0.00.58 0.00.016 0.22:05 Eau Claire Avenue 3.0 0.55 0.01.21 0.00.12 0.02:16 0.22:03 Regent Street 30 0.55 0.01.21 0.00.04 0.02:16 0.22:05 Kosa Road 0.69 0.01.21	State Street			0.17			0:00:30	0:02:16
20 0.36 0.00 0.00.50 0.00.50 0.00.30 0.00.30 Park Street 0.30 0.22 0.00.42 0.00.30 0.00.30 0.10.32 Mills/Charter Street 25 0.16 0.00.36 0.00.33 0.00.30 0.10.32 Randall Avenue 1.24 0.02.16 0.00.36 0.00.30 0.115 0.15.31 Farley Avenue 35 0.52 0.00.12 0.00.15 0.15.31 Shorewood Boulevard 35 0.37 0.00.56 0.00.11 0.00.15 0.15.21 Midvale Boulevard 30 0.46 3.39 0.00.11 0.00.15 0.15.20 Sheboygan Avenue 30 0.46 0.00.56 0.00.15 0.22.050 Eau Claire Avenue 421 0.00.56 0.00.15 0.22.03 Regent Street 30 0.56 0.00.12 0.00.15 0.22.03 Mineral Point Road (MPR align) 5.32 0.01.21 0.00.04 0.00.15 0.22.65 Yellow Stone Drive 30 0.56 0.01.24 0.00.04 0.00.15 0.23.55 <td>Rassett Street</td> <td>10</td> <td>0.33</td> <td>0.50</td> <td>0:02:04</td> <td>0:01:06</td> <td>0.00.30</td> <td>0.05.56</td>	Rassett Street	10	0.33	0.50	0:02:04	0:01:06	0.00.30	0.05.56
Park Street 0.86 0.00 42 0.00 42 0.00 30 <	Dassett Street	20	0.36	0.00	0:01:15	0:00:50	0.00.00	0.00.00
30 0.22 0.00.42 0.00.50 Mills/Charter Street 1.08 0.00.36 0.00.33 Randall Avenue 25 0.16 0.00.36 0.00.30 0.10:32 Randall Avenue 1.24 0.00.36 0.00.50 0.10:30 0.12:11 Farley Avenue 2.50 0.01.12 0.00.15 0.15:31 Shorewood Boulevard 3.0 0.46 0.01.12 0.00.06 0.00:15 0.17:11 Midvale Boulevard 3.0 0.46 0.01.11 0.00.56 0.00:015 0.22:03 Sheboygan Avenue 3.0 0.46 0.01.11 0.00.58 0.00:015 0.22:03 Eau Claire Avenue 3.0 0.56 0.01.21 0.00:015 0.22:03 Regent Street 3.0 0.55 0.01.21 0.00:015 0.22:03 Mineral Point Road (MPR align) 3.5 0.31 0.00 51 0.00:015 0.22:03 Mineral Point Road 0.79 0.01 21 0.00:04 0.00:015 0.23:55	Park Street	20	0.00	0.86	0.01.10	0.00.00	0:00:30	0:08:30
Mills/Charter Street 1.08 0.00.36 0.00.33 0:10:32 Randall Avenue 1.24 0.00.36 0.00.33 0:12:11 Farley Avenue 40 1.26 0.00.216 0.00.050 0:11:32 Farley Avenue 35 0.52 0.01:12 0:00:15 0:15:31 Shorewood Boulevard 35 0.52 0.01:12 0:00:15 0:17:11 Midvale Boulevard 35 0.37 0.00:57 0:00:06 0:00:15 0:18:29 Sheboygan Avenue 30 0.46 0:01:11 0:00:15 0:20:50 Sheboygan Avenue 30 0.36 0:00:58 0:00:015 0:22:03 Sheboygan Avenue 30 0.56 0:01:23 0:00:15 0:22:03 Regent Street		30	0.22		0:00:42	0:00:50		
Randall Avenue 25 0.16 0.00.36 0.00.33 Randall Avenue 1.24 0.00.36 0.00.30 0.12:11 Farley Avenue 2.50 0.00.16 0.00.15 0.15:31 Shorewood Boulevard 35 0.37 0.00.57 0.00.06 0.11:1 Midvale Boulevard 35 0.37 0.00.57 0.00.16 0.17:11 Sheboygan Avenue 30 0.46 0.01.11 0.00.56 0.00:15 0.22:03 Sheboygan Avenue 30 0.46 0.00.12 0.00:15 0.22:03 Bau Claire Avenue 30 0.46 0.00.11 0.00:56 0.00:15 0.22:03 Bau Claire Avenue 30 0.56 0.01.23 0.00:38 0.00:15 0.22:03 Bau Claire Avenue 30 0.56 0.0123 0.00:16 0.22:19 Mineral Point Road (MPR align) 5.53 0.0124 0.00:16 0.28:55 40 0.69 0.0154 0.00:15 0.28:55 40 0.69 0.01:20 0.00:15 0.30:38 Yellow Stone Drive	Mills/Charter Street			1.08			0:00:30	0:10:32
Randall Avenue 124 0.00:10 0.00:30 0:12:11 Farley Avenue 40 1.26 0.00:50 0:00:15 0:15:31 Shorewood Boulevard 35 0.52 0.01.12 0:00:16 0:17:11 Shorewood Boulevard 35 0.37 0.00.57 0:00:06 0:17:11 Midvale Boulevard 35 0.37 0.00.57 0:00:06 0:17:11 Midvale Boulevard 30 0.46 0.01.11 0:00:56 0:18:29 Sheboygan Avenue 30 0.36 0:00:15 0:20:50 0:00:15 0:20:50 Eau Claire Avenue 421 0:00:16 0:22:03 0:00:16 0:22:03 Regent Street 30 0.55 0:01:23 0:00:04 0:02:00 0:27:45 Mineral Point Road (MPR align) 5.32 0:01:24 0:00:04 0:02:20 0:28:55 40 0.69 0:01:24 0:00:04 0:00:15 0:30:38 40 0.69 0:01:24 0:00:052 0:00:30		25	0.16		0:00:36	0:00:33		
And 1 26 0.02 16 0.00 50 Farley Avenue 2.50 0.00 112 0.00 15 0.15 31 Shorewood Boulevard 35 0.52 0.01 12 0.00 15 0.17 11 Midvale Boulevard 33 0.37 0.00 57 0.00 06 0.00 15 0.17 11 Midvale Boulevard 33 0.37 0.00 57 0.00 06 0.00 15 0.18 29 Sheboygan Avenue 30 0.46 0.01 11 0.00 56 0.00 15 0.22 03 Sheboygan Avenue 30 0.46 0.00 58 0.00 00 0.00 15 0.22 03 Eau Claire Avenue	Randall Avenue			1.24			0:00:30	0:12:11
Farley Avenue 0:00:15 0:15:31 Shorewood Boulevard 35 0.52 0.01:12 0.00:15 0:17:11 Shorewood Boulevard 35 0.37 0.00:57 0.00:06 0:00:15 0:17:11 Midvale Boulevard 35 0.37 0.00:57 0.00:06 0:00:15 0:18:29 Sheboygan Avenue 30 0.46 0.01:11 0.00:56 0:00:15 0:20:50 Sheboygan Avenue 30 0.36 0:00:58 0:00:015 0:22:03 Sheboygan Avenue 4.77 0:00:15 0:22:03 0:00:15 0:22:03 Shorewood Boulevard 30 0.55 0:01:23 0:00:15 0:22:03 Sheboygan Avenue 4.77 0:01:23 0:00:15 0:22:03 Shorewood Boulevard 5:32 0:00:15 0:22:19 0:00:15 0:22:19 Mineral Point Road (MPR align) 5:53 0:01:21 0:00:01 0:28:55 Yellow Stone Drive 6:32 0:01:50 0:00:15 0:30:38 <t< td=""><td></td><td>40</td><td>1.26</td><td></td><td>0:02:16</td><td>0:00:50</td><td></td><td></td></t<>		40	1.26		0:02:16	0:00:50		
35 0.52 0.0112 0.0012 Shorewood Boulevard 3.02 0.0057 0.0006 Midvale Boulevard 3.39 0.0111 0.0057 0.0006 Midvale Boulevard 3.39 0.0111 0.0057 0.0006 Sheboygan Avenue 3.85 0.0015 0.2050 Sheboygan Avenue 3.85 0.0058 0.0000 Eau Claire Avenue 4.21 0.0015 0.22:03 Regent Street 4.77 0.00121 0.0004 Mineral Point Road (MPR align) 5.63 0.0121 0.0004 7 5.63 0.0124 0.0004 9 0.0150 0.22:55 40 0.69 0.0124 0.00.04 9 0.0150 0.23:55 40 0.69 0.0124 0.00.04 9 0.0150 0.00:15 0.28:55 40 0.69 0.0124 0.00:16 9 0.0150 0.00:15 0.30:38 9 0.0150 0.00:30 0.33:50 40 0.65 0.0121 0.00.45 9 0.0150 0.00:30 0.33:50 40 0.65 0.0121 0.00.45 40	Farley Avenue			2.50			0:00:15	0:15:31
Shorewood Boulevard 35 0.37 0.00.57 0.00.06 Midvale Boulevard 35 0.37 0.00.57 0.00.06 Sheboygan Avenue 30 0.46 0.01.11 0.00.56 Sheboygan Avenue 30 0.36 0.00.58 0:00:15 0:20:50 Bau Claire Avenue 4.21 0.00.38 0:00:15 0:22:03 Regent Street 4.77 0:00:51 0:22:03 0:02:15 0:22:03 Mineral Point Road (MPR align) 5.63 0:00:51 0:00:15 0:24:19 30 0.55 0:01:21 0:00:04 0:02:00 0:27:45 Rosa Road 5.63 0:01:24 0:00:15 0:28:55 40 0.69 0:01:24 0:00:16 0:28:55 40 0.69 0:01:24 0:00:15 0:28:55 40 0.69 0:01:24 0:00:015 0:28:55 40 0.69 0:01:24 0:00:015 0:30:38 40 0.65 0:01:24 0:00:030 </td <td></td> <td>35</td> <td>0.52</td> <td></td> <td>0:01:12</td> <td>0:00:12</td> <td></td> <td></td>		35	0.52		0:01:12	0:00:12		
Midvale Boulevard 3.3 0.37 0.00.57 0.00.05 Sheboygan Avenue 3.0 0.46 0.01.11 0.00.56 0.00.15 0.20.50 Sheboygan Avenue 3.0 0.36 0.00.58 0.00.00 0.00.15 0.22.03 Eau Claire Avenue 4.21 0.00.38 0.00.38 0.00.15 0.22.03 Regent Street 30 0.56 0.01.23 0.00.38 0.22.19 Mineral Point Road (MPR align) 5.32 0.00.51 0.00.04 0.22.19 Rosa Road 5.63 0.00.51 0.00.04 0.22.150 Yellow Stone Drive 6.32 0.00.51 0.00.04 0.30.33.50 Westfield Road 7.76 0.01.21 0.00.45 0.33.50 High Point 7.76 0.20.227 0.38.29 0.36.26 Totals 7.76 0.20.227 0.38.29 0.36.26	Shorewood Boulevard	ar	0.07	3.02	0.00.57	0.00.00	0:00:15	0:17:11
Mitovale Boblevard 0.00.15 0.00.15 0.16.29 30 0.46 0.01.11 0.00.56 0.00.15 0.20:50 Sheboygan Avenue 30 0.36 0.00.58 0.0000 0.00.15 0.20:50 Eau Claire Avenue 4.21 0.00.38 0.00.15 0.22:03 30 0.56 0.0123 0.00.38 0.02:15 0.22:19 30 0.55 0.0121 0.00.04 0.22:19 0.02:15 0.22:419 Mineral Point Road (MPR align) 5.32 0.00.51 0.00.04 0.00.04 0.00:15 0.22:45 Yellow Stone Drive 6.32 0.00.51 0.00:04 0.00:15 0.28:55 40 0.69 0.01:24 0.00:04 0.30:38 Yellow Stone Drive 6.32 0.01:50 0.00:30 0.33:50 40 0.65 0.01:21 0.00:45 0.00:30 0.33:50 High Point 7.76 0:20:27 0:8:29 Aug Spread (mph) 127.8	Midvala Daulayard	35	0.37	2 20	0:00:57	0:00:06	0.00.45	0.40.00
Sheboygan Avenue 3.85 0.46 0.01.11 0.00.33 Sheboygan Avenue 3.85 0.00.58 0.00.00 0.00:15 0.20:50 Eau Claire Avenue 4.21 0.00:58 0.00:00 0.00:15 0.22:03 Regent Street 30 0.55 0.01.23 0.00:38 0.00:15 0.22:19 Mineral Point Road (MPR align) 30 0.55 0.01.21 0.00:04 0.02:00 0.27:45 Rosa Road 5.63 0.00.124 0.00:04 0.28:55 0.01.24 0:00:15 0.28:55 Yellow Stone Drive 6.32 0.01.24 0:00:15 0:30:38 Westfield Road 7.11 0.01.21 0:00:45 1:30:33:50 High Point 7.76 0:20:27 0:8:29 0:36:26 Totals 7.76 0:20:27 0:8:29 0:07:30 0:36:26	Midvale Boulevard	20	0.46	3.39	0-01-11	0.00-26	0.00.15	0.18.29
Sine boygan Avenue 30 0.36 0.00.58 0.00.10 0.00.15 0.22.03 Eau Claire Avenue 4.21 0.00.58 0.00.38 0.00.15 0.22.03 Regent Street 4.77 0.01.23 0.00.38 0.00.15 0.24.19 Mineral Point Road (MPR align) 5.32 0.00.51 0.00.04 0.00.15 0.22.745 Rosa Road 5.63 0.00.51 0.00.04 0.00.15 0.28.55 40 0.69 0.01.24 0.00.04 0.00.15 0.28.55 40 0.69 0.01.24 0.00.04 0.00.15 0.28.55 40 0.69 0.01.24 0.00.04 0.00.15 0.28.55 40 0.69 0.01.24 0.00.04 0.00.15 0.30.38 Vestfield Road 7.11 0.00.52 0.00.30 0.33:50 High Point 7.76 0.12.1 0.00.45 0.00.30 0.36:26 Totals 7.76 0.20:27 0.08:29 0.07.30 0.36:26	Sheboygan Avenue	-30	0.40	3.85	0.01.11	0.00.30	0.00.12	0.20.50
Eau Claire Avenue 4.21 0.00.00 0.00.00 0.00.015 0.22:03 Regent Street 30 0.56 0.01.23 0.00.38 0:00:15 0:22:03 Mineral Point Road (MPR align) 35 0.35 0.01.21 0:00:04 0:02:00 0:27:45 Rosa Road 5.63 0.00.51 0:00:15 0:28:55 Yellow Stone Drive 6.32 0:01.50 0:00:15 0:30:38 Westfield Road 7.11 0:00:45 0:00:30 0:33:50 High Point 7.76 0:20:27 0:08:29 0:07:30 0:36:26 Totals 7.76 0:20:27 0:08:29 0:07:30 0:36:26	Sheboygan Avenue	30	36 0	0.00	0:00:58	0:00:00	0.00.10	0.20.00
Interview Interview <thinterview< th=""> Interview <thinterview< th=""> Interview Interview</thinterview<></thinterview<>	Fau Claire Avenue		0.50	4 2 1	0.00.00	0.00.00	0:00:15	0.22.03
Regent Street 4.77 0.01 21 0:00:15 0:24:19 30 0.55 0.01 21 0:00:04 0:02:00 0:27:45 Mineral Point Road (MPR align) 5.32 0.00 51 0:00:04 0:00:15 0:27:45 Assa Road 5.63 0.00 51 0:00:04 0:00:15 0:28:55 40 0.69 0:01 24 0:00:04 0:00:15 0:30:38 Yellow Stone Drive 6.32 0.01 50 0:00:52 0:00:30 0:33:50 Westfield Road 7.11 0.01 21 0:00:45 0:00:30 0:36:26 High Point 7.76 0:20:27 0:08:29 0:07:30 0:36:26 Aug Spread (mph): 12.78 12.8 12.8 12.8 12.8	Lud Gland Avenue	30	0.56	7.21	0.01.23	0:00:38	0.00.10	0.22.00
30 0.55 0.01/21 0.00/04 Mineral Point Road (MPR align) 5.32 0.00/51 0.00/04 Rosa Road 5.63 0.00/51 0.00/04 Yellow Stone Drive 40 0.69 0.01/24 0.00/04 Westfield Road 7.11 0.01/24 0.00/30 0:33:50 High Point 7.76 0:20:27 0:08:29 0:36:26 Totals 7.76 0:20:27 0:08:29 0:07:30 0:36:26	Regent Street			4.77			0:00:15	0:24:19
Mineral Point Road (MPR align) 5.32 0:00:00 0:02:00 0:27:45 35 0.31 0:00:51 0:00:04 0:28:55 40 0.69 0:01:24 0:00:04 0:28:55 Yellow Stone Drive 6.32 0:01:24 0:00:05 0:00:05 Westfield Road 0.79 0:01:50 0:00:52 0:03:38 High Point 7.76 0:01:21 0:00:45 0:03:30 0:33:50 Totals 7.76 0:20:27 0:08:29 0:07:30 0:36:26	-	30	0.55		0:01:21	0:00:04		
35 0.31 0.00.51 0.00.04 Rosa Road 35 0.31 0.00.51 0.00.04 Yellow Stone Drive 6.32 0.01.24 0.00.015 0.33.38 Yellow Stone Drive 6.32 0.01.50 0.00.52 0.00.030 0.33.50 Westfield Road 40 0.65 0.01.21 0.00.45 0.00.30 0.33.50 High Point 7.76 0.20.27 0.08.29 0.07.30 0.36.26 Totals 7.76 0.20.27 0.08.29 0.07.30 0.36.26	Mineral Point Road (MPR align)			5.32			0:02:00	0:27:45
Rosa Road 5.63 0:00:15 0:28:55 40 0.69 0.01:24 0:00:04 0:30:38 Yellow Stone Drive 6.32 0.01:50 0:00:15 0:30:38 30 0.79 0.01:50 0:00:52 0:01:30 0:33:50 Westfield Road 7.11 0.01:21 0:00:45 0:00:30 0:36:26 High Point 7.76 0:20:27 0:08:29 0:07:30 0:36:26 Totals 7.76 0:20:27 0:08:29 0:07:30 0:36:26		35	0.31		0:00:51	0:00:04		
40 0.69 0.0124 0.00.04 Yellow Stone Drive 6.32 0.0124 0.00.04 30 0.79 0.0150 0.00.52 Westfield Road 7.11 0.0121 0.00.45 40 0.65 0.0121 0.00.30 0:33:50 High Point 7.76 0:20:27 0:08:29 0:07:30 0:36:26 Totals 7.76 0:20:27 0:08:29 0:07:30 0:36:26	Rosa Road			5.63			0:00:15	0:28:55
Yellow Stone Drive 6.32 30 0.79 0.01 50 0.01 50 0.00:15 0.00 52 0.30:38 Westfield Road 7.11 40 0.01 50 0.05 2 0.00 52 0:00:30 0:33:50 High Point 7.76 0.01 21 0:00:45 0:00:30 0:36:26 Totals 7.76 0:20:27 0:08:29 0:07:30 0:36:26		40	0.69		0:01:24	0:00:04		
30 0.79 0.01 50 0.00.52 Westfield Road 7.11 0:00:30 0:33:50 40 0.65 0:01 21 0:00:45 High Point 7.76 0:20:27 0:08:29 0:07:30 0:36:26 Totals 7.76 0:20:27 0:08:29 0:07:30 0:36:26	Yellow Stone Drive		_	6.32			0:00:15	0:30:38
Vestfield Road 7.11 0:00:30 0:33:50 40 0.65 0:01:21 0:00:45 High Point 7.76 0:02:27 0:08:29 0:07:30 0:36:26 Totals 7.76 0:20:27 0:08:29 0:07:30 0:36:26		30	0.79		0:01:50	0:00:52		
40 0.65 0.0121 0.00.45 High Point 7.76 0:00:20 0:00:30 0:36:26 Totals 7.76 0:20:27 0:08:29 0:07:30 0:36:26	Westfield Road		0.05	7.11		0.00.15	0:00:30	0:33:50
High Point 7.76 0:20:27 0:08:29 0:07:30 0:36:26 Totals 7.76 0:20:27 0:08:29 0:07:30 0:36:26	LUNE Delat	40	0.65	7 70	0.01.21	0:00:45	0.00.00	0.00.00
Totals 7.76 0:20:27 0:08:29 0:07:30 0:36:26	High Point			1.76			0:00:30	0:36:26
1.10 0.20.27 0.06.29 0.07.30 0.30.20	Totale			7 76	0.20.27	0.08.20	0.02.30	0.36.26
	lotuis			1.10	0.20.27	0.00.25	Avg Speed (mph):	12 78

west contra	JIIIav	31 111116		ale – Ouai	ia Ruau A	Anginnent	
Station	Max Spd. [mph]	Distance [mi]	Total Distance	Run Time (hr:min:sec)	Delay Time (hr:min:sec)	Dwell Time (hr:min:sec)	Total Time (hr:min:sec)
Capitol Square	40		0.00	0.01.00	0.00.40	0:00:00	0:00:00
State Street	10	• 0.17	0.17	0101106	0:00:40	0:00:30	0:02:16
Bassett Street	10	0.33	0.50	0:02:04	0:01:06	0:00:30	0:05:56
Park Street	20	0.36	0.86	0:01:15	0:00:50	0:00:30	0:08:30
Mills/Charter Street	30	0.22	1.08	0:00:42	0:00:50	0:00:30	0:10:32
Randall Avenue	25	0.16	1.24	0:00:36	0:00:33	0:00:30	0:12:11
Farlev Avenue	40	1 <i>.</i> 26	2.50	0:02:16	0:00:50	0:00:15	0:15:31
Shorewood Boulevard	35	0.52	3.02	0:01:12	0:00:12	0:00:15	0.17.11
Midvale Boulevard	35	0.37	3 3 9	0:00:57	0:00:06	0:00:15	0.18.29
Sheboygan Avenue	30	0.46	3.85	0:01:11	0:00:56	0:00:15	0.20.50
Sneboygan Avenue	30	0.36	4.04	0:00:58	0:00:00	0:00:15	0.20.00
	30	0.56	4.21	0:01:23	0:00:38	0.00.15	0.22.03
Regent Street	30	0.55	4.//	0:01:21	0:00:04	0:00:15	0:24:19
Mineral Point Rod (Odana Rd align)	35	0.60	5.32	0:01:20	0:00:09	0:00:15	0:26:00
West Transfer Point	35	0.71	5.92	0:01:32	0:00:09	0:02:00	0:29:28
Research Park Boulevard	30	0.60	6.63	0:01:27	0:00:04	0:00:15	0:31:24
Grand Canyon Drive	25	0.45	7.23	0:01:17	0:00:29	0:00:15	0:33:10
West Towne Mall	25	0.28	7.68	0:00:53	0:00:00	0:00:30	0:35:27
Westfield Road	40	0.65	7.96	0.01.21	0:00:45	0:00:30	0:36:50
High Point			8.61			0:00:30	0:39:26
Totals			8.61	0:22:51	0:08:20	0:08:15 Avg. Speed (mph):	0:39:26 13.10

Table 9West Corridor Travel Time Estimate – Odana Road Alignment

Travel Time Validation

The last step consists of a comparison of estimated BRT travel times to current bus travel times, as reflected in bus schedules. Existing travel times and average speeds have been determined for key routes in each BRT corridor. The route comparisons provided below do not necessarily follow the exact alignment of proposed BRT routes, but they do provide an indication of typical bus travel times and operating speeds within each corridor.

- East Corridor Route 6 via MATC has a p.m. peak travel time of 32 minutes and an average speed of 13.5 mph from Capitol Square to East Towne Mall, with a similar alignment. The estimated BRT travel time estimate is 25:39, with an average speed of 14.7 mph, a 9 percent improvement in average speed.
- West Corridor There is no single existing route that currently operates between Capitol Square and High Point Road along an alignment similar to the proposed BRT alignment. Route 14 comes close, with service to Mineral Point Road and Westfield Road. Existing Metro schedules indicate Route 14 has a p.m. peak travel time of 39 minutes from Capitol Square to Gammon Road and Tree Lane. The route's outbound travel time would be slightly longer to Westfield Road and Mineral Point Road. The estimated BRT travel time estimate to Westfield Road and Mineral Point Road is 33:50. Thus, BRT p.m. peak outbound travel times reflect an improvement of approximately 13 percent.

The alternative Odana Road West Corridor alignment serves the existing West Transfer Point. There are multiple existing route options from Capitol Square to the West Transfer Point that can be used in a comparison to BRT times. Route 2 provides the most comparable local route service with a 38 minute p.m. peak period travel time. The proposed BRT travel time estimate is 29:28, a 22 percent improvement over Route 2. Routes 56 and 57 provide a quicker p.m. peak travel time of 28 minutes to the West Transfer Point. However, Routes 56 and 57 are peak period limited stop routes and do not continue to the West Towne Mall area. A transfer to either Routes 67 or 73 would be required.

- North Corridor There is no single route that currently operates from Capitol Square to the North Town Center. A combination of Routes 2 and 22 are required to make this trip, resulting in a total travel time of about 31 minutes (including a transfer at the North Transfer Point). The estimated one-seat ride travel time for BRT is 18:11, with a 14.2 mph average speed. As a comparison, the average operating speed for Route 2 from Capitol Square to the existing North Transfer Point is 13.1 mph.
- South Corridor There is no single route that currently operates from Capitol Square to Caddis Bend/Fish Hatchery Road along the same alignment that is proposed for BRT. Route 47 provides somewhat comparable service, with a 38 minute p.m. peak travel time. The estimated BRT travel time is 29:19 (23% faster) with an 11.25 mph average speed. For comparison purposes, the average operating speed for Routes 4 and 5 from Capitol Square to the South Transfer Point is 9.7 mph.

Finally, it is once again important to note that BRT travel times calculated for this study are intended represent <u>reasonable</u> estimates of anticipated travel times, and do not specifically take into account possible travel time impacts related to factors such as ADA boardings/alightings, weather impacts, road construction and traffic incident impacts. BRT route cycle times will be established that provide a reasonable time for recovery of such occurrences.