2019 PEAK SEASON FACTOR CATEGORY REPORT - REPORT TYPE: ALL
CATEGORY: 8700 MIAMI-DADE NORTH

MOCF: 0.97

WEEK	DATES	SF	PSCF
1	01/01/2019 - 01/05/2019	1.03	1.06
2	01/06/2019 - 01/12/2019	1.02	1.05
3	01/13/2019 - 01/19/2019	1.01	1.04
4	01/20/2019 - 01/26/2019	1.00	1.03
* 5	01/27/2019 - 02/02/2019	0.98	1.01
* 6	02/03/2019 - 02/09/2019	0.97	1.00
* 7	02/10/2019 - 02/16/2019	0.96	0.99
* 8	02/17/2019 - 02/23/2019	0.96	0.99
* 9	02/24/2019 - 03/02/2019	0.96	0.99
*10	03/03/2019 - 03/09/2019	0.96	0.99
*11	03/10/2019 - 03/16/2019	0.97	1.00
*12	03/17/2019 - 03/23/2019	0.97	1.00
*13	03/24/2019 - 03/30/2019	0.97	1.00
*14	03/31/2019 - 04/06/2019	0.97	1.00
*15	04/07/2019 - 04/13/2019	0.98	1.01
*16	04/14/2019 - 04/20/2019	0.98	1.01
*17	04/21/2019 - 04/27/2019	0.98	1.01
18	04/28/2019 - 05/04/2019	0.99	1.02
19	05/05/2019 - 05/11/2019	0.99	1.02
20	05/12/2019 - 05/18/2019	1.00	1.03
21	05/19/2019 - 05/25/2019	1.00	1.03
22	05/26/2019 - 06/01/2019	1.01	1.04
23	06/02/2019 - 06/08/2019	1.01	1.04
24	06/09/2019 - 06/15/2019	1.02	1.05
25	06/16/2019 - 06/22/2019	1.02	1.05
26	06/23/2019 - 06/29/2019	1.02	1.05
27	06/30/2019 - 07/06/2019	1.02	1.05
28	07/07/2019 - 07/13/2019	1.03	1.06
29	07/14/2019 - 07/20/2019	1.03	1.06
30	07/21/2019 - 07/27/2019	1.03	1.06
31	07/28/2019 - 08/03/2019	1.02	1.05
32	08/04/2019 - 08/10/2019	1.02	1.05
33	08/11/2019 - 08/17/2019	1.02	1.05
34	08/18/2019 - 08/24/2019	1.02	1.05
35	08/25/2019 - 08/31/2019	1.02	1.05
36	09/01/2019 - 09/07/2019	1.03	1.06
37	09/08/2019 - 09/14/2019	1.03	1.06
38	09/15/2019 - 09/21/2019	1.03	1.06
39	09/22/2019 - 09/28/2019	1.02	1.05
40	09/29/2019 - 10/05/2019	1.01	1.04
41	10/06/2019 - 10/12/2019	1.00	1.03
42	10/13/2019 - 10/19/2019	0.99	1.02
43	10/20/2019 - 10/26/2019	1.00	1.03
44	10/27/2019 - 11/02/2019	1.00	1.03
45	11/03/2019 - 11/09/2019	1.01	1.04
46	11/10/2019 - 11/16/2019	1.01	1.04
47	11/17/2019 - 11/23/2019	1.02	1.05
48	11/24/2019 - 11/30/2019	1.02	1.05
49	12/01/2019 - 12/07/2019	1.02	1.05
50	12/08/2019 - 12/14/2019	1.03	1.06
51	12/15/2019 - 12/21/2019	1.03	1.06
52	12/22/2019 - 12/28/2019	1.02	1.05
53	12/29/2019 - 12/31/2019	1.01	1.04

* PEAK SEASON

COVID ADJUSTMENT FACTOR CALULATION
411 MICHIGAN

Description / Roadway	AM Covid Factor	PM Covid Factor
SR A1A/MacArthur Causeway/5th Street	1.46	1.62
Average	**1.46**	**1.62**

Description / Roadway	EB 5th Street	WB 5th Street
03/10/2020 AM Peak-Hour Counts *	1192	915
03/11/2020 AM Peak-Hour Counts *	1173	858
03/12/2020 AM Peak-Hour Counts *	1196	903
Average 2019 AM Peak-Hour Counts*	**1187**	**892**
08/05/2021 AM Peak-Hour Counts **	660	796
Average 2021 Peak Hour Counts**	**660**	**796**
AM Adjustment Factor	1.80	1.12
Average AM Adjustment Factor	**1.46**	
03/10/2020 PM Peak-Hour Counts *	1246	1566
03/11/2020 AM Peak-Hour Counts *	1280	1485
03/12/2020 AM Peak-Hour Counts *	1249	1561
Average 2019 AM Peak-Hour Counts*	**1258**	**1537**
08/05/2021 PM Peak-Hour Counts **	751	987
Average 2021 Peak Hour Counts**	**751**	**987**
PM Adjustment Factor	1.68	1.56
Average PM Adjustment Factor	**1.62**	

**2020 data based on EB & WB FDOT count station 2528 on 5th Street.*

***2021 data based on EB & WB count data on SW 5th Street*

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GROWTH RATE CALCULATION

411 MICHIGAN

Roadway	FDOT Site	Linear		Exponential		Decaying	
		9 Year Trend	R^2	9 Year Trend	R^2	9 Year Trend	R^2
S POINTE DR -- 150 FT W OF WASHINGTON AVE	8590	-2.85%	42.43%	-3.46%	44.65%	-2.17%	20.75%
SR A1A/MACARTHUR CSWY -- 150' N OF MERIDIAN AVE	2528	1.36%	7.52%	1.16%	6.65%	1.65%	10.76%
SR AIA/COLLINS AV -- 200' N 5 ST(MIAMI BEACH)	5159	-2.32%	37.80%	-2.46%	36.13%	-3.03%	54.18%
11TH ST -- 200' EAST OF MERIDIAN CT	8532	-2.87%	80.20%	-3.21%	79.37%	-3.09%	74.25%
Average Annual Growth Rate		**-1.67%**	**41.99%**	**-1.99%**	**41.70%**	**-1.66%**	**39.99%**

Used 0.5% Growth Rate

Roadway	FDOT Site	Linear		Exponential		Decaying	
		5 Year Trend	R^2	5 Year Trend	R^2	5 Year Trend	R^2
S POINTE DR -- 150 FT W OF WASHINGTON AVE	8590	-9.32%	93.01%	-10.42%	92.38%	-9.64%	79.27%
SR A1A/MACARTHUR CSWY -- 150' N OF MERIDIAN AVE	2528	-0.54%	0.31%	-0.62%	0.41%	-0.68%	0.57%
SR AIA/COLLINS AV -- 200' N 5 ST(MIAMI BEACH)	5159	0.76%	2.18%	0.94%	1.99%	0.56%	0.68%
11TH ST -- 200' EAST OF MERIDIAN CT	8532	-2.36%	30.87%	-2.45%	31.02%	-1.94%	31.89%
Average Annual Growth Rate		**-2.87%**	**31.59%**	**-3.14%**	**31.45%**	**-2.93%**	**28.10%**

Used 0.5% Growth Rate

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FLORIDA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION STATISTICS OFFICE
2020 HISTORICAL AADT REPORT

COUNTY: 87 - MIAMI-DADE

SITE: 2528 - SR A1A/MACARTHUR CSWY, 150' N OF MERIDIAN AVE

YEAR	AADT	DIRECTION 1	DIRECTION 2	*K FACTOR	D FACTOR	T FACTOR
2020	41000 C	E 19000	W 22000	9.00	54.30	9.20
2019	31000 F	E 15500	W 15500	9.00	54.00	5.00
2018	32000 C	E 16000	W 16000	9.00	55.20	5.60
2017	44000 C	E 20000	W 24000	9.00	54.00	5.30
2016	35500 C	E 18500	W 17000	9.00	55.50	7.80
2015	39500 C	E 20000	W 19500	9.00	55.10	4.60
2014	33000 C	E 17000	W 16000	9.00	54.30	5.10
2013	34000 C	E 17500	W 16500	9.00	54.10	6.10
2012	32500 C	E 14500	W 18000	9.00	53.40	8.40
2011	35000 C	E 16500	W 18500	9.00	51.90	7.50
2010	35000 C	E 16500	W 18500	7.16	52.27	8.80
2009	35500 C	E 16500	W 19000	9.21	57.60	8.40
2008	34500 C	E 16000	W 18500	7.42	52.15	5.30
2007	34000 C	E 16500	W 17500	7.11	53.51	4.90
2006	40500 C	E 19500	W 21000	7.18	52.50	2.20
2005	35000 C	E 16000	W 19000	7.30	52.50	5.50

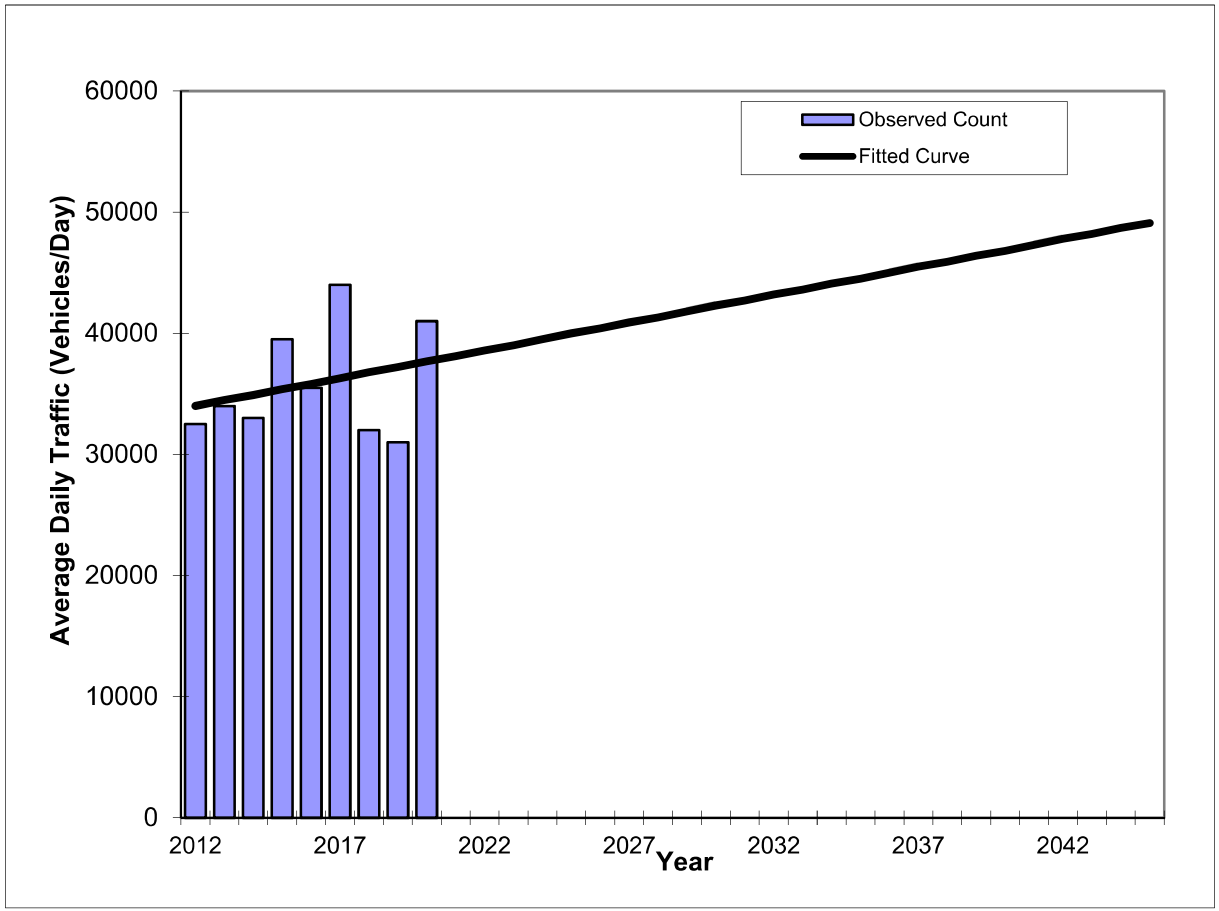
AADT FLAGS: C = COMPUTED; E = MANUAL ESTIMATE; F = FIRST YEAR ESTIMATE
S = SECOND YEAR ESTIMATE; T = THIRD YEAR ESTIMATE; R = FOURTH YEAR ESTIMATE
V = FIFTH YEAR ESTIMATE; 6 = SIXTH YEAR ESTIMATE; X = UNKNOWN
*K FACTOR: STARTING WITH YEAR 2011 IS STANDARDK, PRIOR YEARS ARE K30 VALUES

Traffic Trends - V3.0

SR A1A/MACARTHUR CSWY -- 150' N OF MERIDIAN AVE

FIN#	0
Location	1

County:	Miami-Dade (87)
Station #:	2528
Highway:	SR A1A/MACARTHUR CSWY



Year	Traffic (ADT/AADT) Count*	Trend**
2012	32500	34000
2013	34000	34500
2014	33000	34900
2015	39500	35400
2016	35500	35800
2017	44000	36300
2018	32000	36800
2019	31000	37200
2020	41000	37700
2023 Opening Year Trend		
2023	N/A	39000
2035 Mid-Year Trend		
2035	N/A	44500
2045 Design Year Trend		
2045	N/A	49100
TRANPLAN Forecasts/Trends		

**** Annual Trend Increase:**	458
Trend R-squared:	7.52%
Trend Annual Historic Growth Rate:	1.36%
Trend Growth Rate (2020 to Design Year):	1.21%
Printed:	17-Aug-21

Straight Line Growth Option

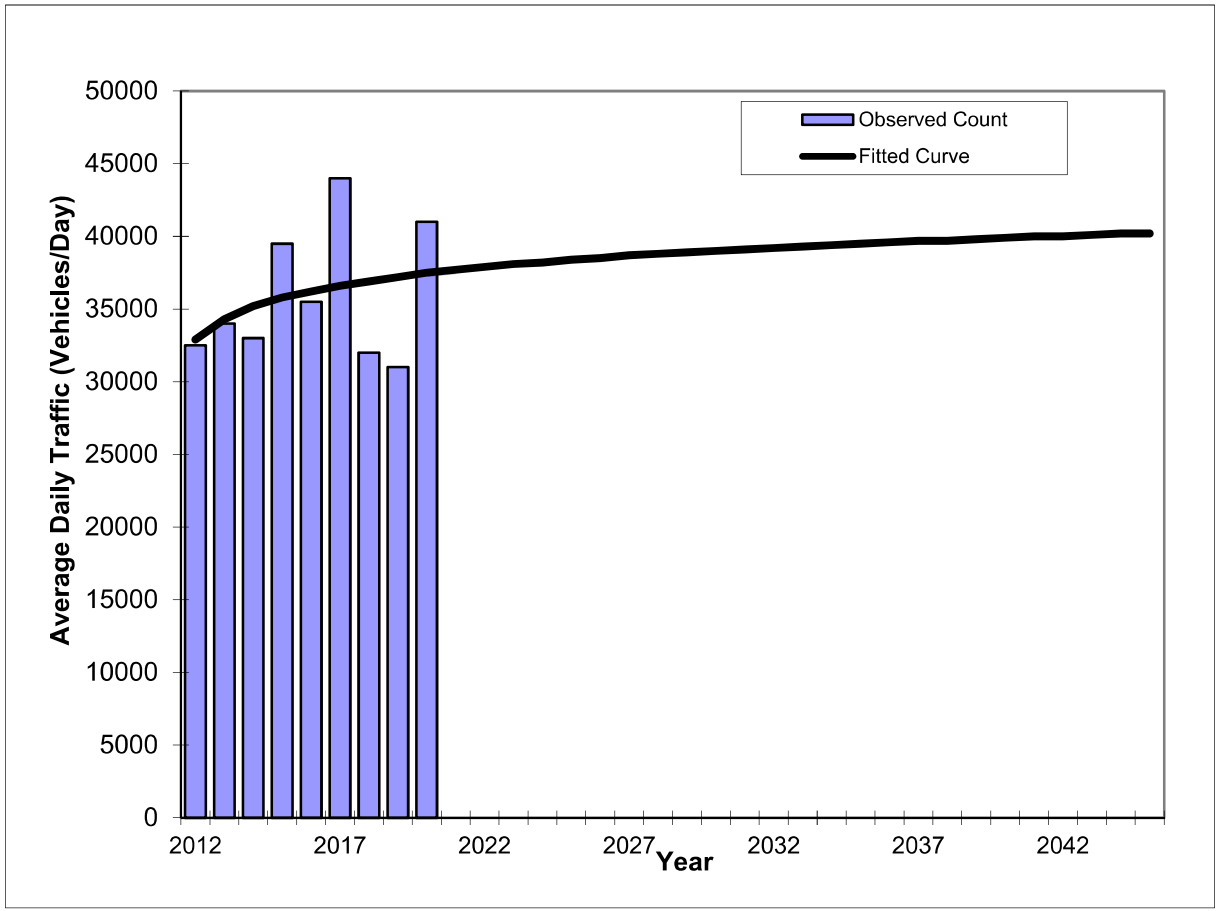
***Axle-Adjusted**

Traffic Trends - V3.0

MACARTHUR CAUSEWAY -- 150' N OF MERIDIAN AVE

FIN#	0
Location	1

County:	Miami-Dade (87)
Station #:	2528
Highway:	MACARTHUR CAUSEWAY



Year	Traffic (ADT/AADT) Count*	Trend**
2012	32500	32900
2013	34000	34300
2014	33000	35200
2015	39500	35800
2016	35500	36200
2017	44000	36600
2018	32000	36900
2019	31000	37200
2020	41000	37500
2023 Opening Year Trend		
2023	N/A	38100
2035 Mid-Year Trend		
2035	N/A	39500
2045 Design Year Trend		
2045	N/A	40200
TRANPLAN Forecasts/Trends		

Trend R-squared:	10.76%
Compounded Annual Historic Growth Rate:	1.65%
Compounded Growth Rate (2020 to Design Year):	0.28%
Printed:	1-Oct-21

Decaying Exponential Growth Option

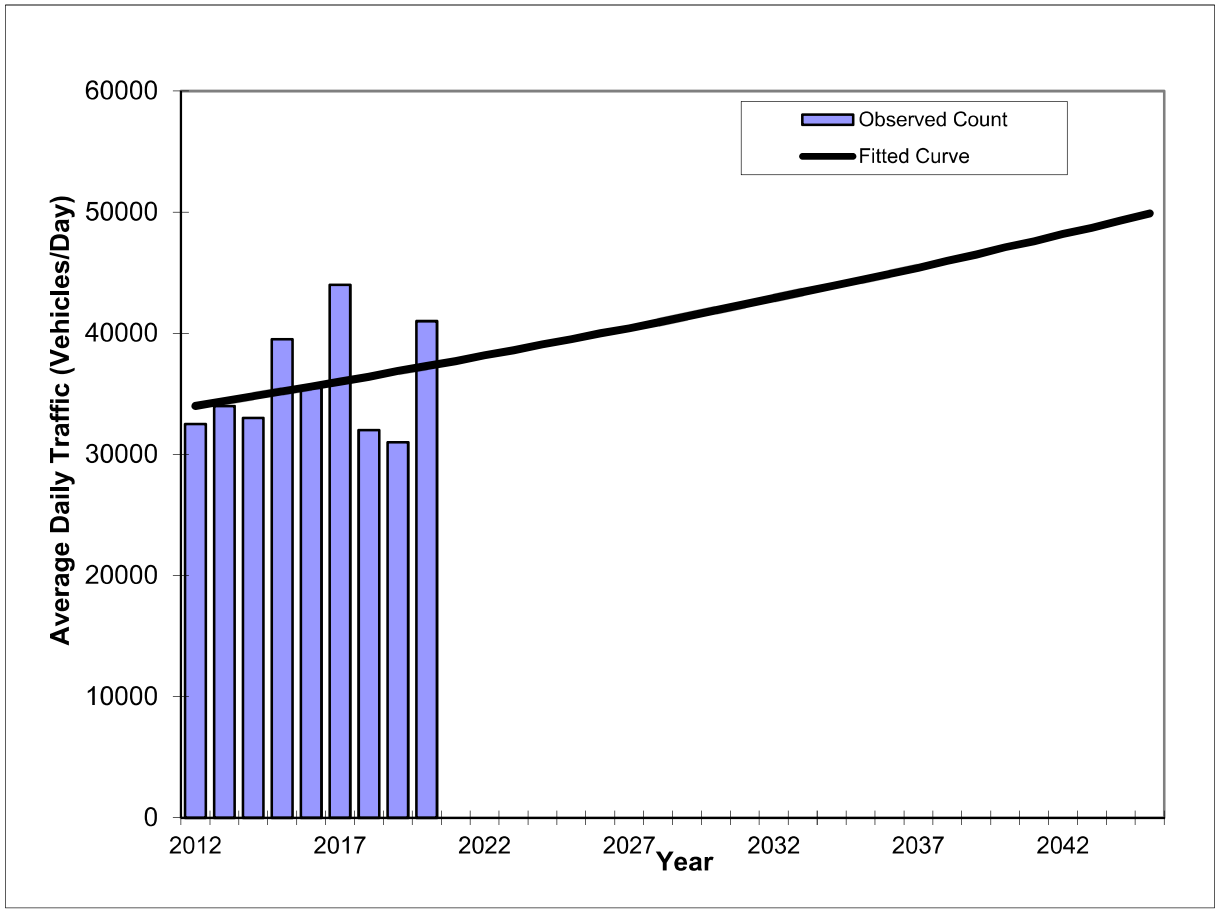
***Axle-Adjusted**

Traffic Trends - V3.0

MACARTHUR CAUSEWAY -- 150' N OF MERIDIAN AVE

FIN#	0
Location	1

County:	Miami-Dade (87)
Station #:	2528
Highway:	MACARTHUR CAUSEWAY



Year	Traffic (ADT/AADT) Count*	Trend**
2012	32500	34000
2013	34000	34400
2014	33000	34800
2015	39500	35200
2016	35500	35600
2017	44000	36000
2018	32000	36400
2019	31000	36900
2020	41000	37300
2023 Opening Year Trend		
2023	N/A	38600
2035 Mid-Year Trend		
2035	N/A	44400
2045 Design Year Trend		
2045	N/A	49900
TRANPLAN Forecasts/Trends		

Trend R-squared:	6.65%
Compounded Annual Historic Growth Rate:	1.16%
Compounded Growth Rate (2020 to Design Year):	1.17%
Printed:	1-Oct-21

Exponential Growth Option

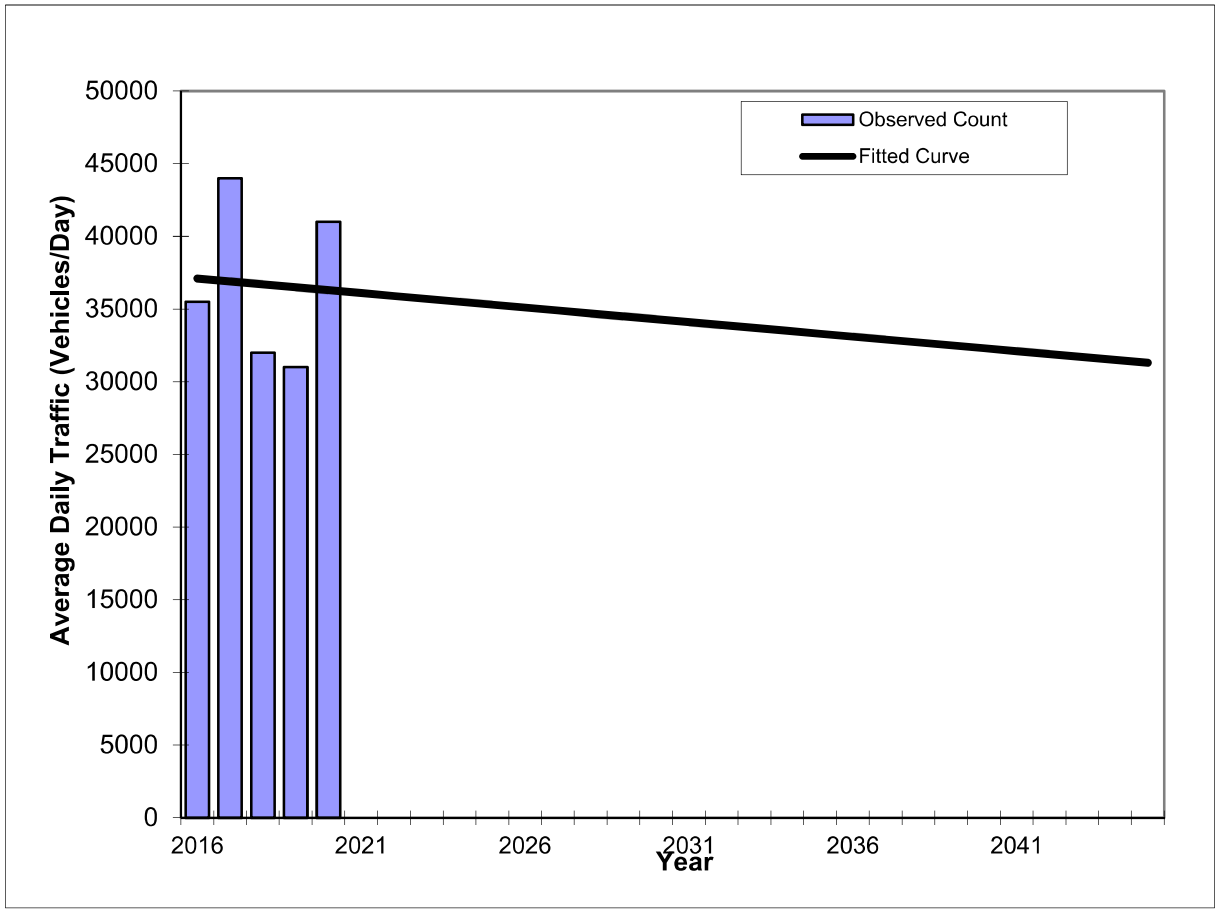
***Axle-Adjusted**

Traffic Trends - V3.0

MACARTHUR CAUSEWAY -- 150' N OF MERIDIAN AVE

FIN#	0
Location	1

County:	Miami-Dade (87)
Station #:	2528
Highway:	MACARTHUR CAUSEWAY



Year	Traffic (ADT/AADT) Count*	Trend**
2016	35500	37100
2017	44000	36900
2018	32000	36700
2019	31000	36500
2020	41000	36300
2023 Opening Year Trend		
2023	N/A	35700
2035 Mid-Year Trend		
2035	N/A	33300
2045 Design Year Trend		
2045	N/A	31300
TRANPLAN Forecasts/Trends		

**** Annual Trend Increase:**	-200
Trend R-squared:	0.31%
Trend Annual Historic Growth Rate:	-0.54%
Trend Growth Rate (2020 to Design Year):	-0.55%
Printed:	1-Oct-21

Straight Line Growth Option

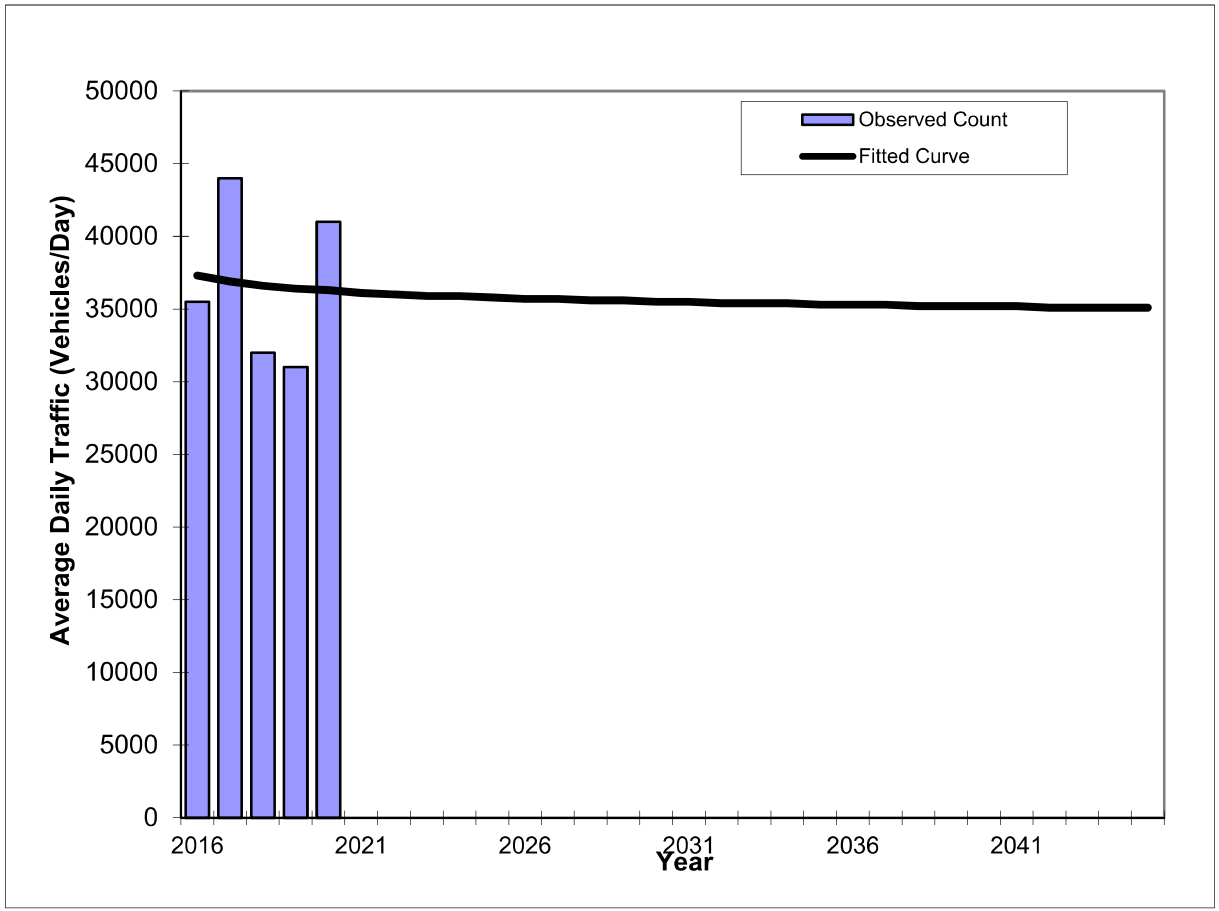
***Axle-Adjusted**

Traffic Trends - V3.0

MACARTHUR CAUSEWAY -- 150' N OF MERIDIAN AVE

FIN#	0
Location	1

County:	Miami-Dade (87)
Station #:	2528
Highway:	MACARTHUR CAUSEWAY



Year	Traffic (ADT/AADT) Count*	Trend**
2016	35500	37300
2017	44000	36900
2018	32000	36600
2019	31000	36400
2020	41000	36300
2023 Opening Year Trend		
2023	N/A	35900
2035 Mid-Year Trend		
2035	N/A	35300
2045 Design Year Trend		
2045	N/A	35100
TRANPLAN Forecasts/Trends		

Trend R-squared:	0.57%
Compounded Annual Historic Growth Rate:	-0.68%
Compounded Growth Rate (2020 to Design Year):	-0.13%
Printed:	1-Oct-21

Decaying Exponential Growth Option

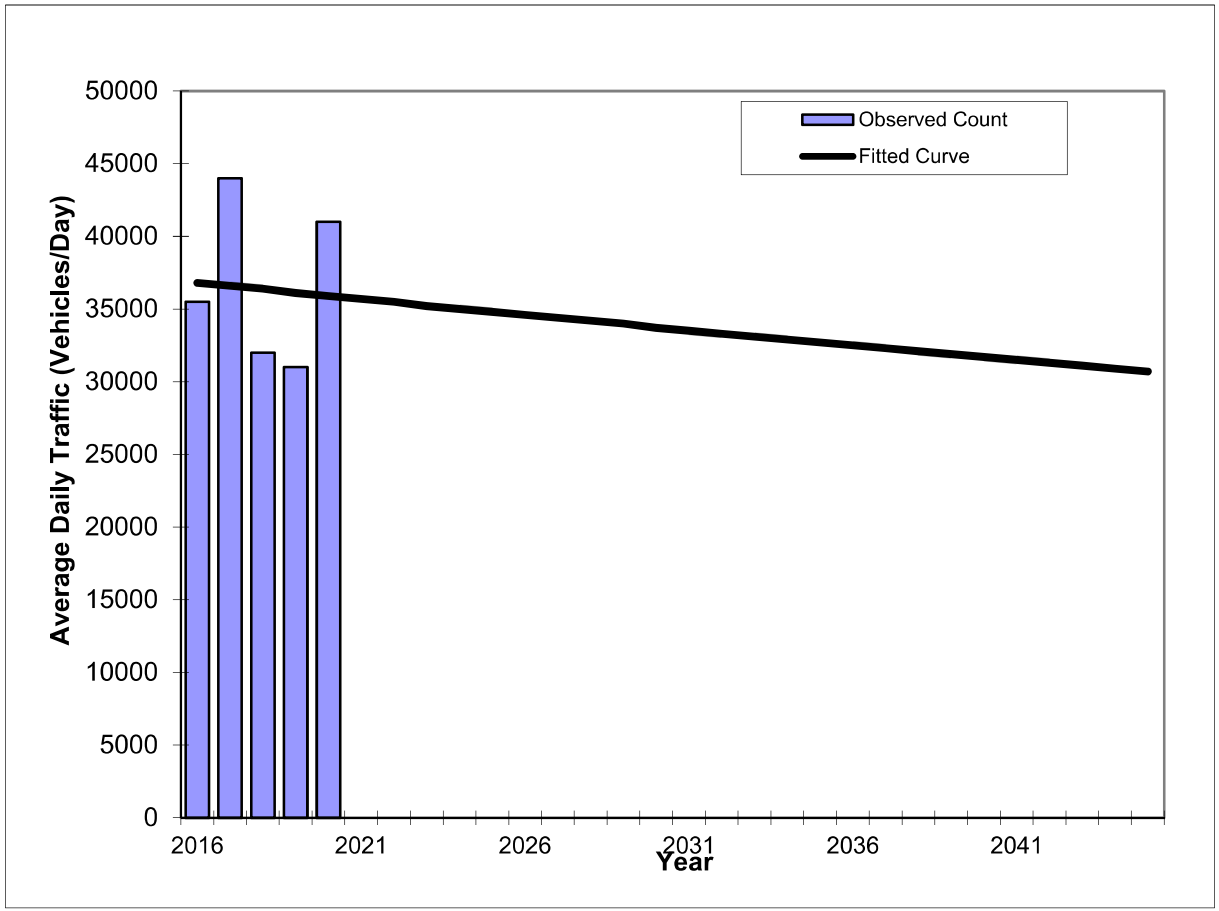
***Axle-Adjusted**

Traffic Trends - V3.0

MACARTHUR CAUSEWAY -- 150' N OF MERIDIAN AVE

FIN#	0
Location	1

County:	Miami-Dade (87)
Station #:	2528
Highway:	MACARTHUR CAUSEWAY



Year	Traffic (ADT/AADT) Count*	Trend**
2016	35500	36800
2017	44000	36600
2018	32000	36400
2019	31000	36100
2020	41000	35900
2023 Opening Year Trend		
2023	N/A	35200
2035 Mid-Year Trend		
2035	N/A	32700
2045 Design Year Trend		
2045	N/A	30700
TRANPLAN Forecasts/Trends		

Trend R-squared:	0.41%
Compounded Annual Historic Growth Rate:	-0.62%
Compounded Growth Rate (2020 to Design Year):	-0.62%
Printed:	1-Oct-21

Exponential Growth Option

***Axle-Adjusted**

FLORIDA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION STATISTICS OFFICE
2020 HISTORICAL AADT REPORT

COUNTY: 87 - MIAMI-DADE

SITE: 5159 - SR AIA/COLLINS AV, 200' N 5 ST(MIAMI BEACH)

YEAR	AADT	DIRECTION 1	DIRECTION 2	*K FACTOR	D FACTOR	T FACTOR
2020	14500 C	N 6900	S 7600	9.00	54.20	9.20
2019	12900 C	N 6900	S 6000	9.00	54.60	5.00
2018	11800 C	N 6600	S 5200	9.00	54.30	5.60
2017	14600 C	N 8800	S 5800	9.00	55.00	5.30
2016	13100 C	N 6700	S 6400	9.00	54.50	7.80
2015	13800 C	N 5500	S 8300	9.00	54.70	4.60
2014	13400 C	N 6500	S 6900	9.00	54.50	5.10
2013	16400 C	N 7400	S 9000	9.00	52.40	6.10
2012	16700 C	N 7100	S 9600	9.00	55.70	8.40
2011	13600 C	N 6900	S 6700	9.00	55.10	7.50
2010	12900 C	N 6200	S 6700	8.98	54.08	8.80
2009	15300 C	N 7600	S 7700	8.99	53.24	8.40
2008	13600 C	N 6300	S 7300	9.09	55.75	5.30
2007	14300 C	N 6500	S 7800	8.01	54.34	4.90
2006	13100 C	N 5800	S 7300	7.97	54.22	2.20
2005	16100 C	N 7300	S 8800	8.80	53.80	5.50

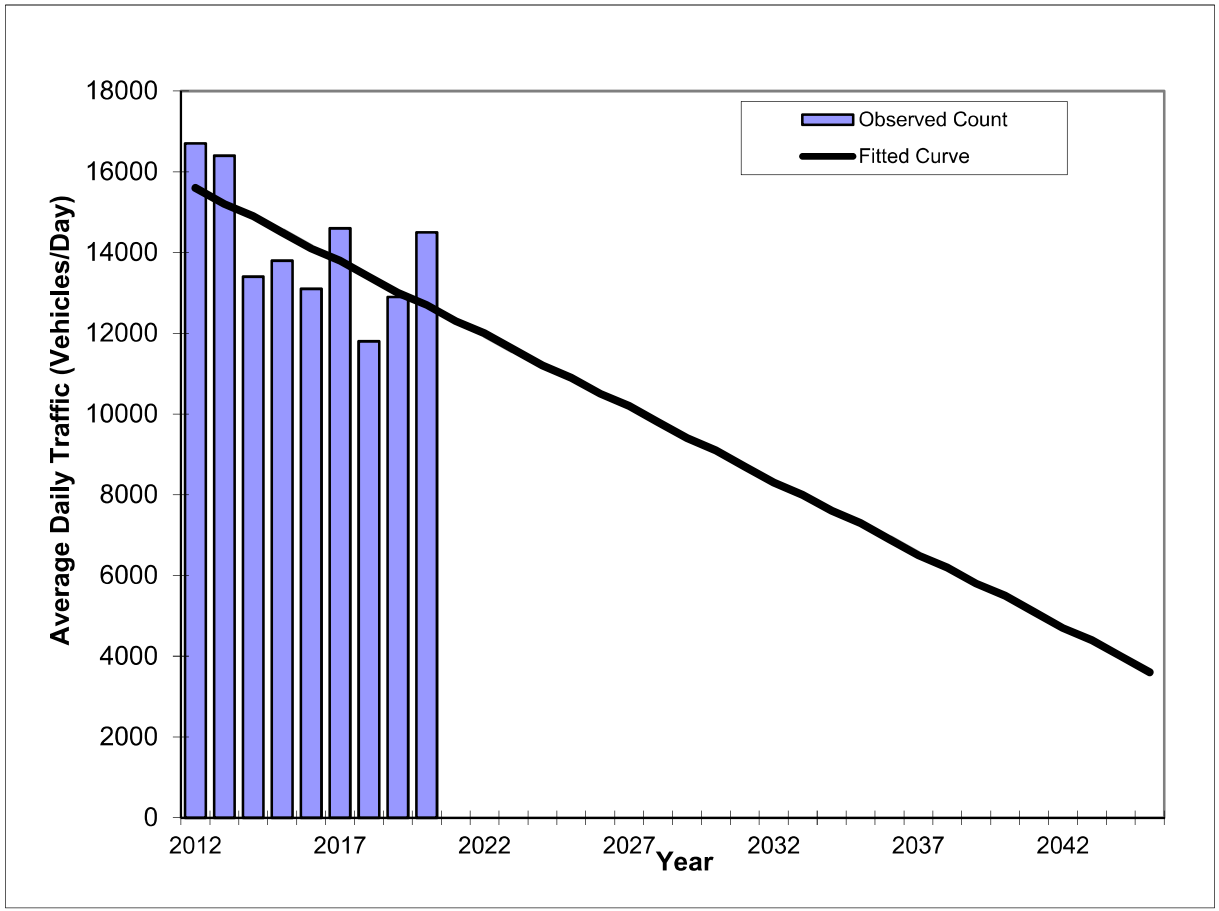
AADT FLAGS: C = COMPUTED; E = MANUAL ESTIMATE; F = FIRST YEAR ESTIMATE
S = SECOND YEAR ESTIMATE; T = THIRD YEAR ESTIMATE; R = FOURTH YEAR ESTIMATE
V = FIFTH YEAR ESTIMATE; 6 = SIXTH YEAR ESTIMATE; X = UNKNOWN
*K FACTOR: STARTING WITH YEAR 2011 IS STANDARDK, PRIOR YEARS ARE K30 VALUES

Traffic Trends - V3.0

SR AIA/COLLINS AV -- 200' N 5 ST(MIAMI BEACH)

FIN#	0
Location	1

County:	Miami-Dade (87)
Station #:	5159
Highway:	SR AIA/COLLINS AV



Year	Traffic (ADT/AADT) Count*	Trend**
2012	16700	15600
2013	16400	15200
2014	13400	14900
2015	13800	14500
2016	13100	14100
2017	14600	13800
2018	11800	13400
2019	12900	13000
2020	14500	12700
2023 Opening Year Trend		
2023	N/A	11600
2035 Mid-Year Trend		
2035	N/A	7300
2045 Design Year Trend		
2045	N/A	3600
TRANPLAN Forecasts/Trends		

** Annual Trend Increase:	-362
Trend R-squared:	37.80%
Trend Annual Historic Growth Rate:	-2.32%
Trend Growth Rate (2020 to Design Year):	-2.87%
Printed:	17-Aug-21

Straight Line Growth Option

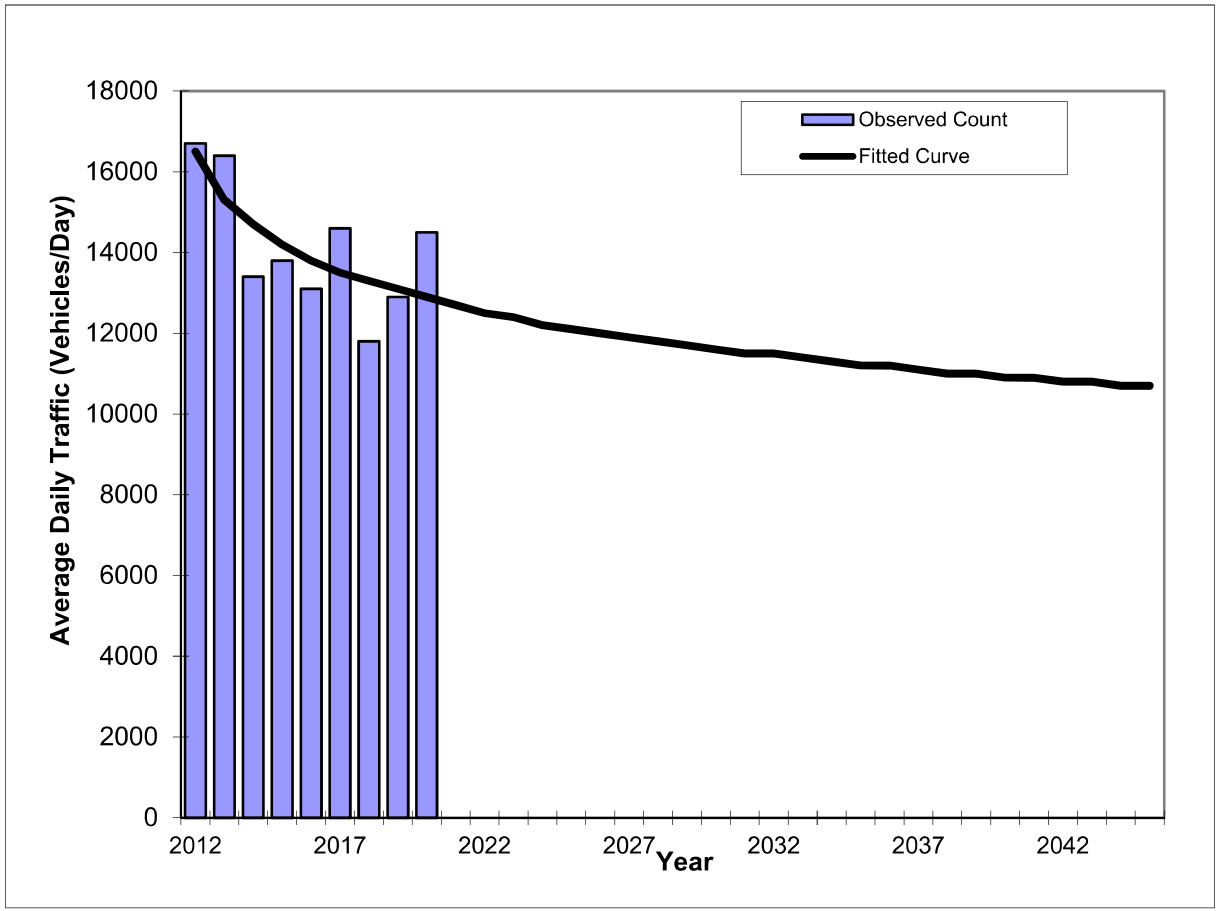
*Axle-Adjusted

Traffic Trends - V3.0

COLLINS AVE -- 200' N 5 ST

FIN#	0
Location	1

County:	Miami-Dade (87)
Station #:	5159
Highway:	COLLINS AVE



Year	Traffic (ADT/AADT) Count*	Trend**
2012	16700	16500
2013	16400	15300
2014	13400	14700
2015	13800	14200
2016	13100	13800
2017	14600	13500
2018	11800	13300
2019	12900	13100
2020	14500	12900
2023 Opening Year Trend		
2023	N/A	12400
2035 Mid-Year Trend		
2035	N/A	11200
2045 Design Year Trend		
2045	N/A	10700
TRANPLAN Forecasts/Trends		

Trend R-squared:	54.18%
Compounded Annual Historic Growth Rate:	-3.03%
Compounded Growth Rate (2020 to Design Year):	-0.75%
Printed:	1-Oct-21

Decaying Exponential Growth Option

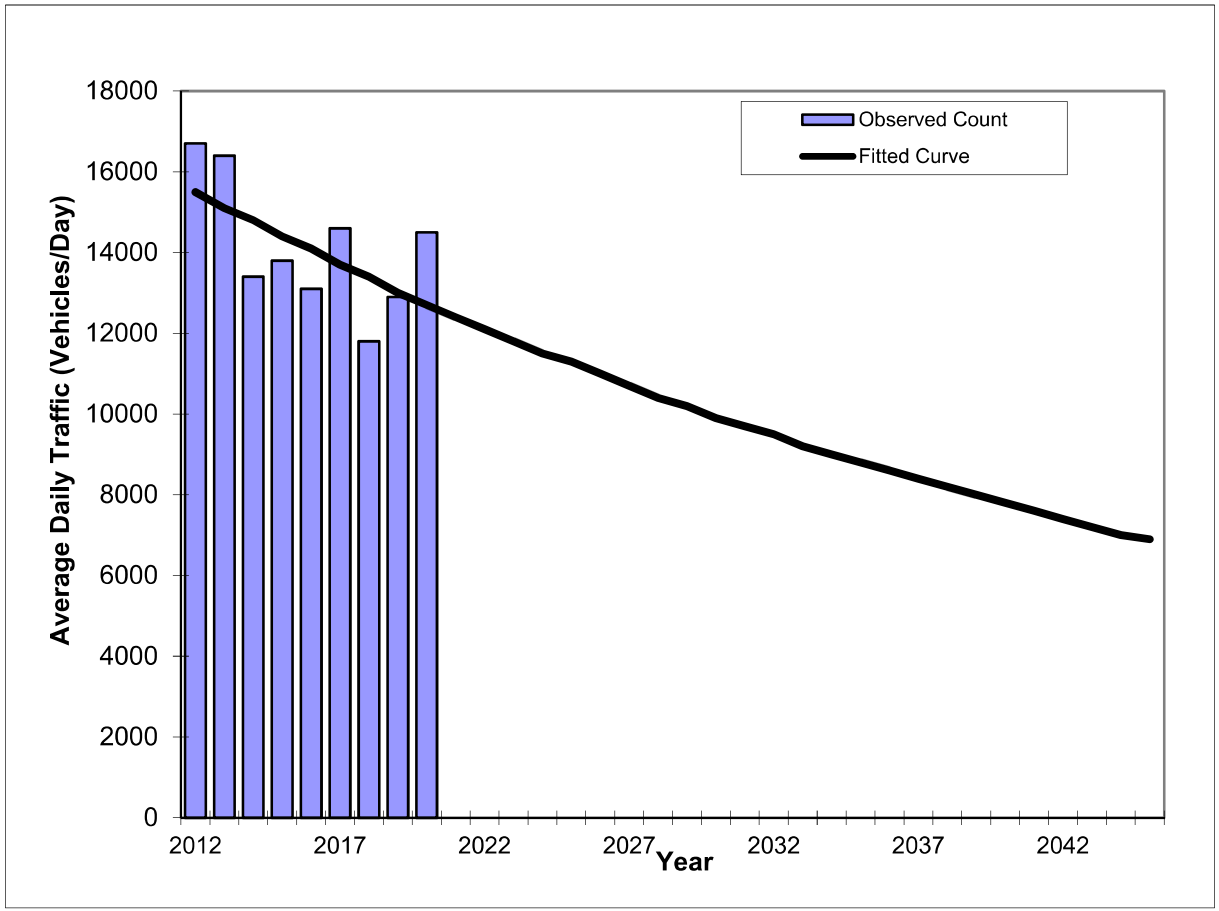
***Axle-Adjusted**

Traffic Trends - V3.0

COLLINS AVE -- 200' N 5 ST

FIN#	0
Location	1

County:	Miami-Dade (87)
Station #:	5159
Highway:	COLLINS AVE



Year	Traffic (ADT/AADT) Count*	Trend**
2012	16700	15500
2013	16400	15100
2014	13400	14800
2015	13800	14400
2016	13100	14100
2017	14600	13700
2018	11800	13400
2019	12900	13000
2020	14500	12700
2023 Opening Year Trend		
2023	N/A	11800
2035 Mid-Year Trend		
2035	N/A	8800
2045 Design Year Trend		
2045	N/A	6900
TRANPLAN Forecasts/Trends		

Trend R-squared:	36.13%
Compounded Annual Historic Growth Rate:	-2.46%
Compounded Growth Rate (2020 to Design Year):	-2.41%
Printed:	1-Oct-21

Exponential Growth Option

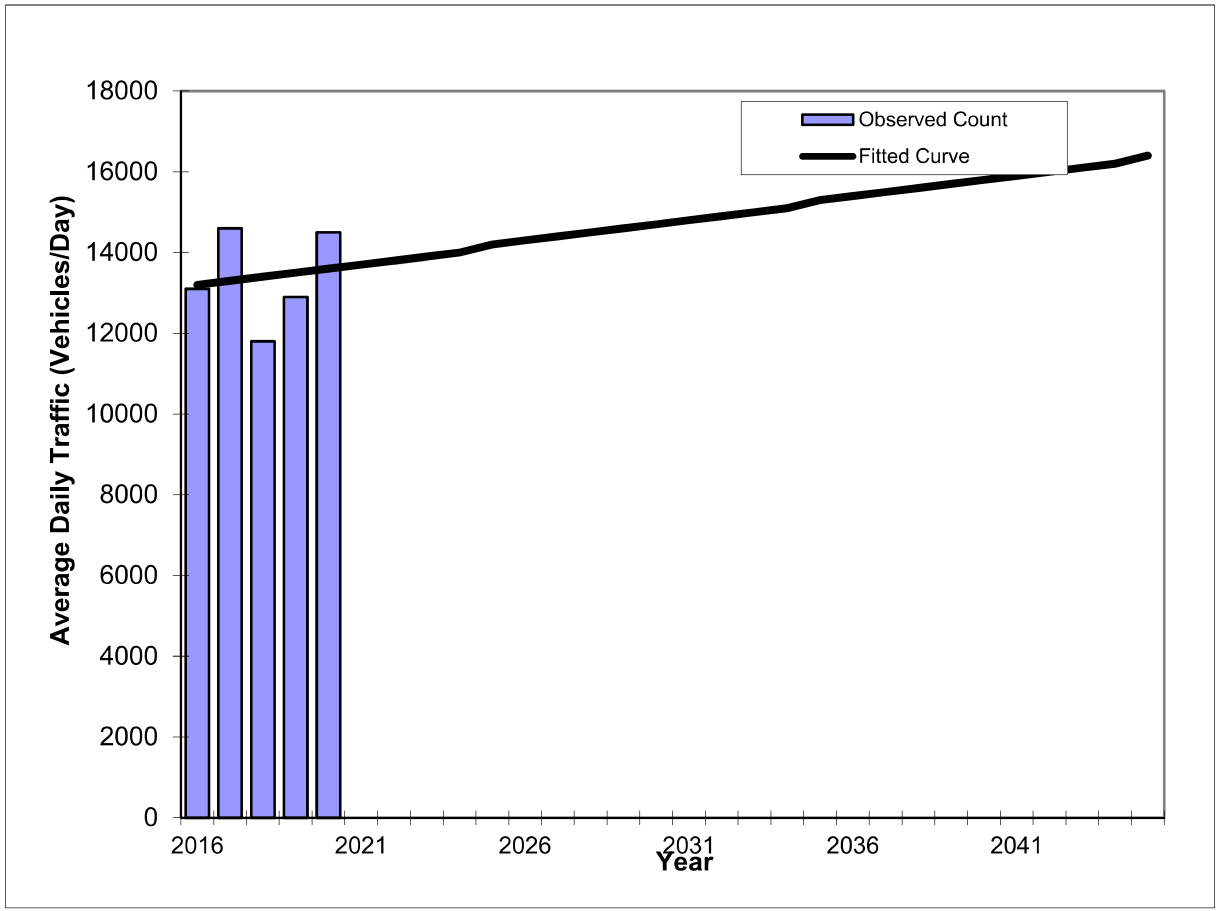
***Axle-Adjusted**

Traffic Trends - V3.0

COLLINS AVE -- 200' N 5 ST

FIN#	0
Location	1

County:	Miami-Dade (87)
Station #:	5159
Highway:	COLLINS AVE



Year	Traffic (ADT/AADT) Count*	Trend**
2016	13100	13200
2017	14600	13300
2018	11800	13400
2019	12900	13500
2020	14500	13600
2023 Opening Year Trend		
2023	N/A	13900
2035 Mid-Year Trend		
2035	N/A	15300
2045 Design Year Trend		
2045	N/A	16400
TRANPLAN Forecasts/Trends		

**** Annual Trend Increase:**	110
Trend R-squared:	2.18%
Trend Annual Historic Growth Rate:	0.76%
Trend Growth Rate (2020 to Design Year):	0.82%
Printed:	1-Oct-21

Straight Line Growth Option

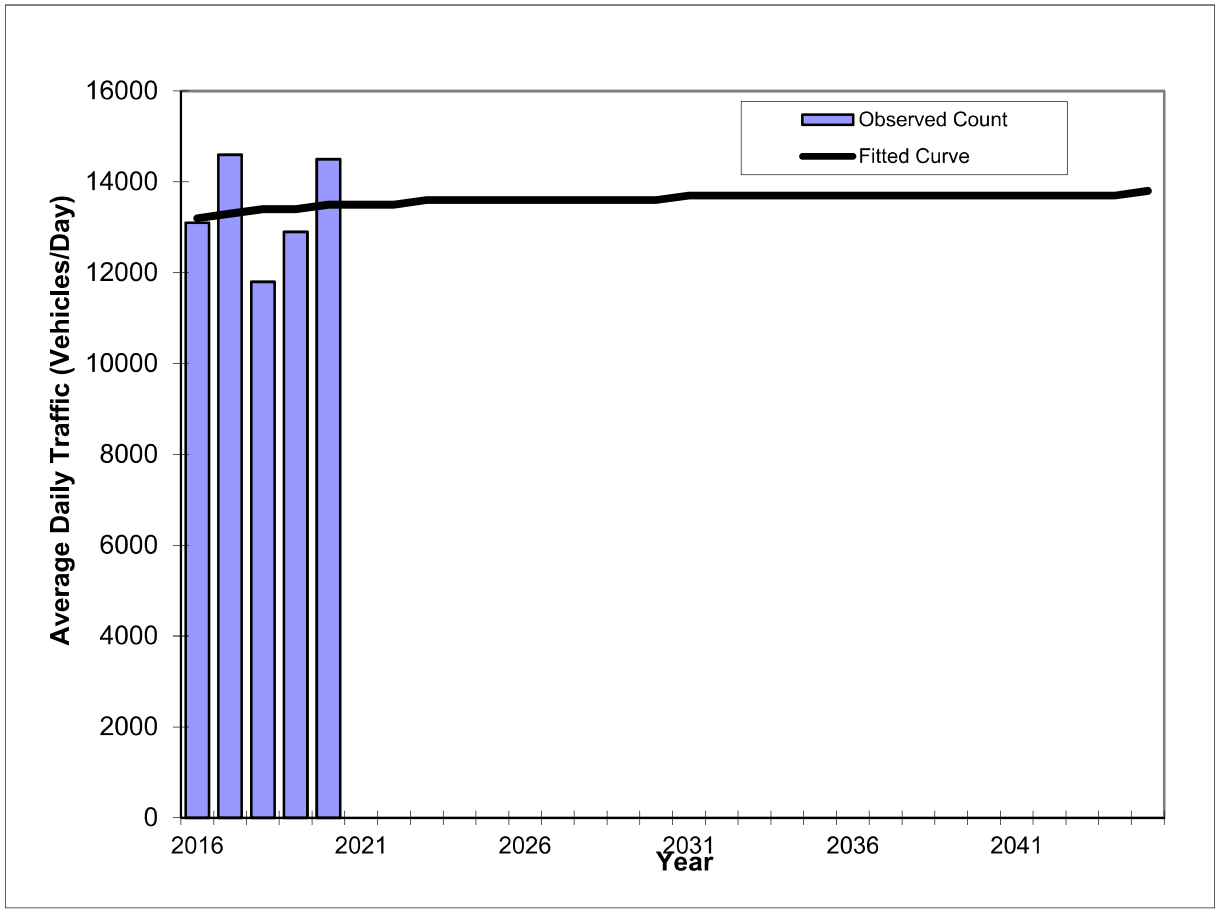
***Axle-Adjusted**

Traffic Trends - V3.0

COLLINS AVE -- 200' N 5 ST

FIN#	0
Location	1

County:	Miami-Dade (87)
Station #:	5159
Highway:	COLLINS AVE



Year	Traffic (ADT/AADT) Count*	Trend**
2016	13100	13200
2017	14600	13300
2018	11800	13400
2019	12900	13400
2020	14500	13500
2023 Opening Year Trend		
2023	N/A	13600
2035 Mid-Year Trend		
2035	N/A	13700
2045 Design Year Trend		
2045	N/A	13800
TRANPLAN Forecasts/Trends		

Trend R-squared:	0.68%
Compounded Annual Historic Growth Rate:	0.56%
Compounded Growth Rate (2020 to Design Year):	0.09%
Printed:	1-Oct-21

Decaying Exponential Growth Option

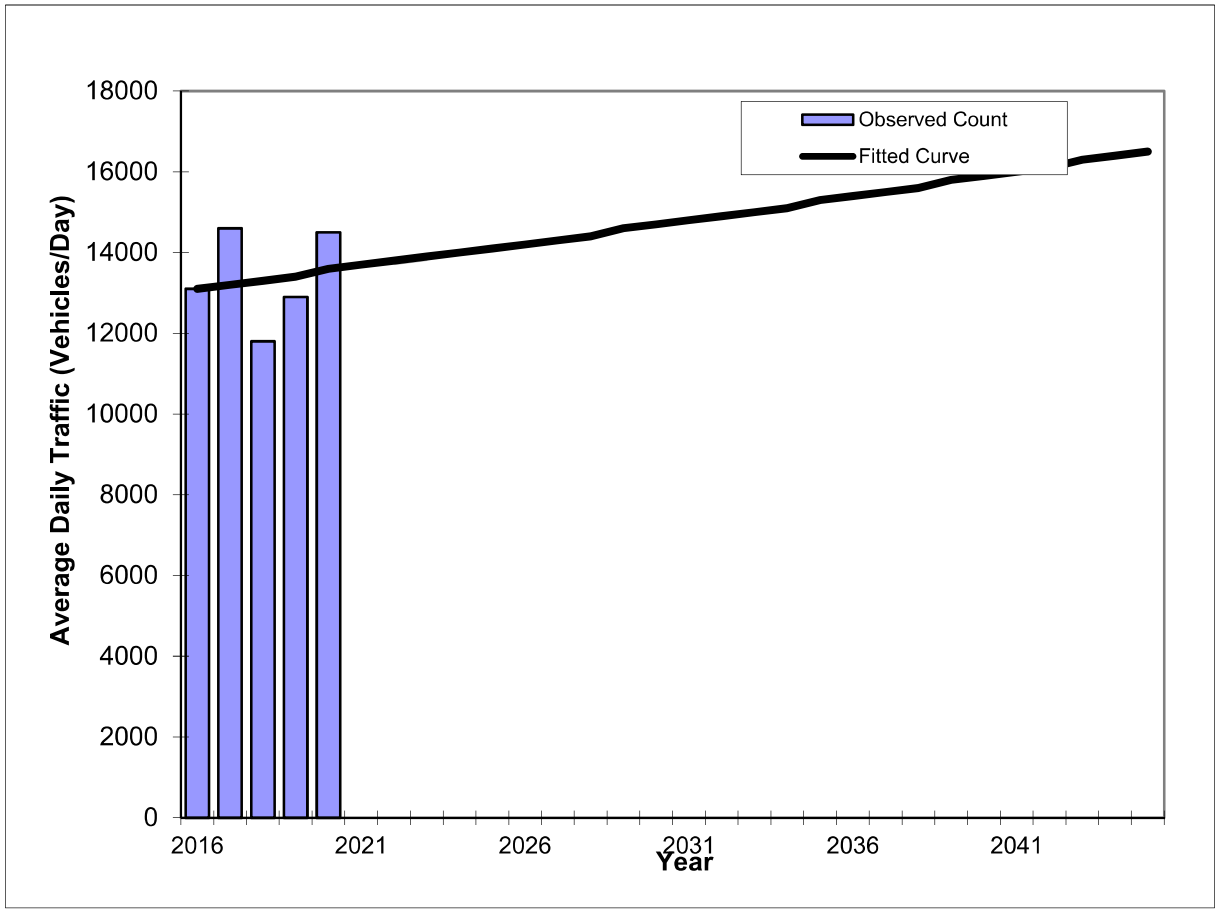
***Axle-Adjusted**

Traffic Trends - V3.0

COLLINS AVE -- 200' N 5 ST

FIN#	0
Location	1

County:	Miami-Dade (87)
Station #:	5159
Highway:	COLLINS AVE



Year	Traffic (ADT/AADT) Count*	Trend**
2016	13100	13100
2017	14600	13200
2018	11800	13300
2019	12900	13400
2020	14500	13600
2023 Opening Year Trend		
2023	N/A	13900
2035 Mid-Year Trend		
2035	N/A	15300
2045 Design Year Trend		
2045	N/A	16500
TRANPLAN Forecasts/Trends		

Trend R-squared:	1.99%
Compounded Annual Historic Growth Rate:	0.94%
Compounded Growth Rate (2020 to Design Year):	0.78%
Printed:	1-Oct-21

Exponential Growth Option

***Axle-Adjusted**

FLORIDA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION STATISTICS OFFICE
2020 HISTORICAL AADT REPORT

COUNTY: 87 - MIAMI-DADE

SITE: 8532 - 11TH ST, 200' EAST OF MERIDIAN CT (2011 OFF SYSTEM CYCLE)

YEAR	AADT	DIRECTION 1	DIRECTION 2	*K FACTOR	D FACTOR	T FACTOR
2020	4700 F	E 2500	W 2200	9.00	56.00	4.40
2019	5300 C	E 2800	W 2500	9.00	56.00	4.00
2018	4700 T	E 2700	W 2000	9.00	54.30	3.00
2017	5200 S	E 3000	W 2200	9.00	59.30	2.50
2016	5300 F	E 3100	W 2200	9.00	56.10	5.10
2015	5400 C	E 3200	W 2200	9.00	57.40	7.10
2014	6000 S			9.00	59.30	10.70
2013	6000 F	0	0	9.00	58.90	16.20
2012	6000 C	E 0	W 0	9.00	59.70	16.00

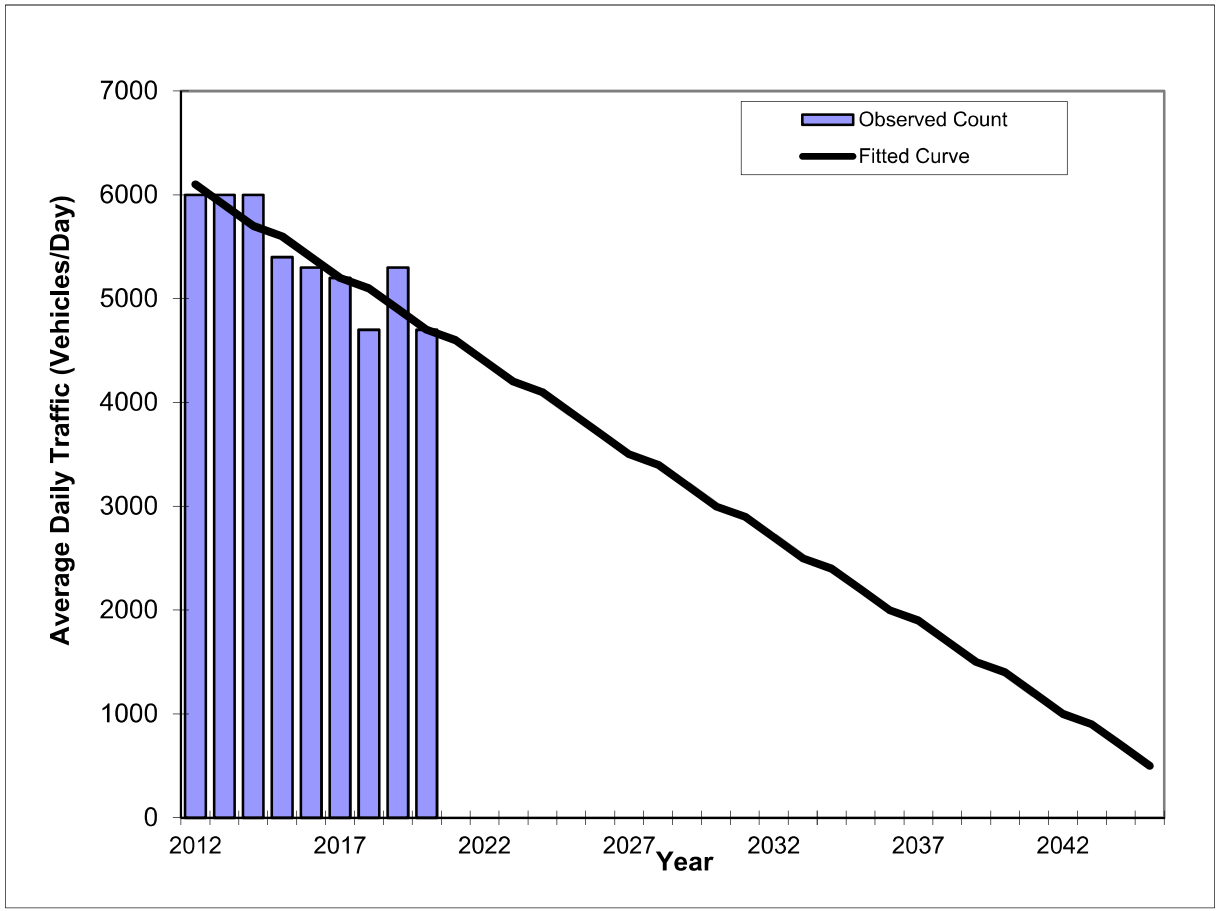
AADT FLAGS: C = COMPUTED; E = MANUAL ESTIMATE; F = FIRST YEAR ESTIMATE
S = SECOND YEAR ESTIMATE; T = THIRD YEAR ESTIMATE; R = FOURTH YEAR ESTIMATE
V = FIFTH YEAR ESTIMATE; 6 = SIXTH YEAR ESTIMATE; X = UNKNOWN
*K FACTOR: STARTING WITH YEAR 2011 IS STANDARDK, PRIOR YEARS ARE K30 VALUES

Traffic Trends - V3.0

11TH ST -- 200' EAST OF MERIDIAN CT

FIN#	0
Location	1

County:	Miami-Dade (87)
Station #:	8532
Highway:	11TH ST



Year	Traffic (ADT/AADT) Count*	Trend**
2012	6000	6100
2013	6000	5900
2014	6000	5700
2015	5400	5600
2016	5300	5400
2017	5200	5200
2018	4700	5100
2019	5300	4900
2020	4700	4700
2023 Opening Year Trend		
2023	N/A	4200
2035 Mid-Year Trend		
2035	N/A	2200
2045 Design Year Trend		
2045	N/A	500
TRANPLAN Forecasts/Trends		

** Annual Trend Increase:	-168
Trend R-squared:	80.20%
Trend Annual Historic Growth Rate:	-2.87%
Trend Growth Rate (2020 to Design Year):	-3.57%
Printed:	17-Aug-21

Straight Line Growth Option

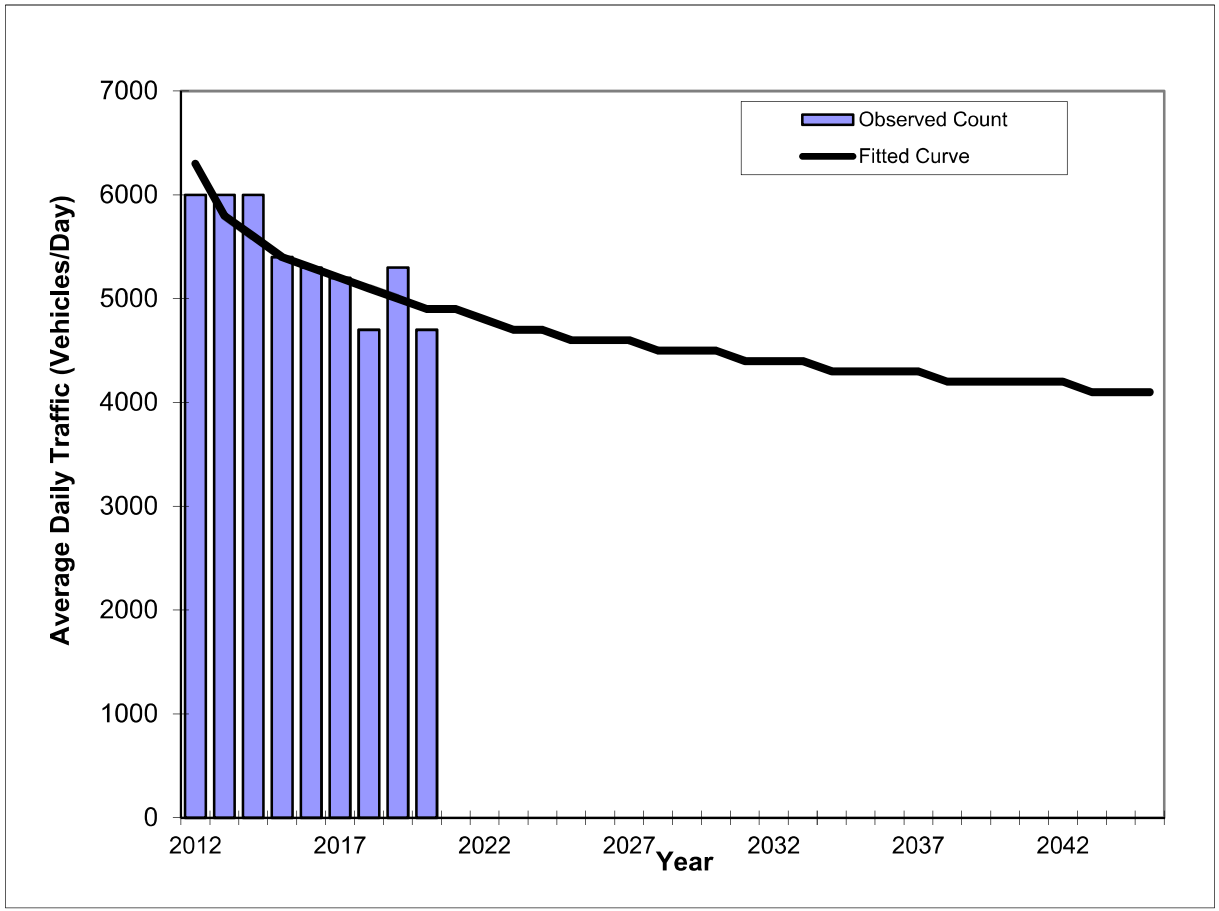
*Axle-Adjusted

Traffic Trends - V3.0

11TH ST -- 200' EAST OF MERIDIAN CT

FIN#	0
Location	1

County:	Miami-Dade (87)
Station #:	8532
Highway:	11TH ST



Year	Traffic (ADT/AADT) Count*	Trend**
2012	6000	6300
2013	6000	5800
2014	6000	5600
2015	5400	5400
2016	5300	5300
2017	5200	5200
2018	4700	5100
2019	5300	5000
2020	4700	4900
2023 Opening Year Trend		
2023	N/A	4700
2035 Mid-Year Trend		
2035	N/A	4300
2045 Design Year Trend		
2045	N/A	4100
TRANPLAN Forecasts/Trends		

Trend R-squared:	74.25%
Compounded Annual Historic Growth Rate:	-3.09%
Compounded Growth Rate (2020 to Design Year):	-0.71%
Printed:	1-Oct-21

Decaying Exponential Growth Option

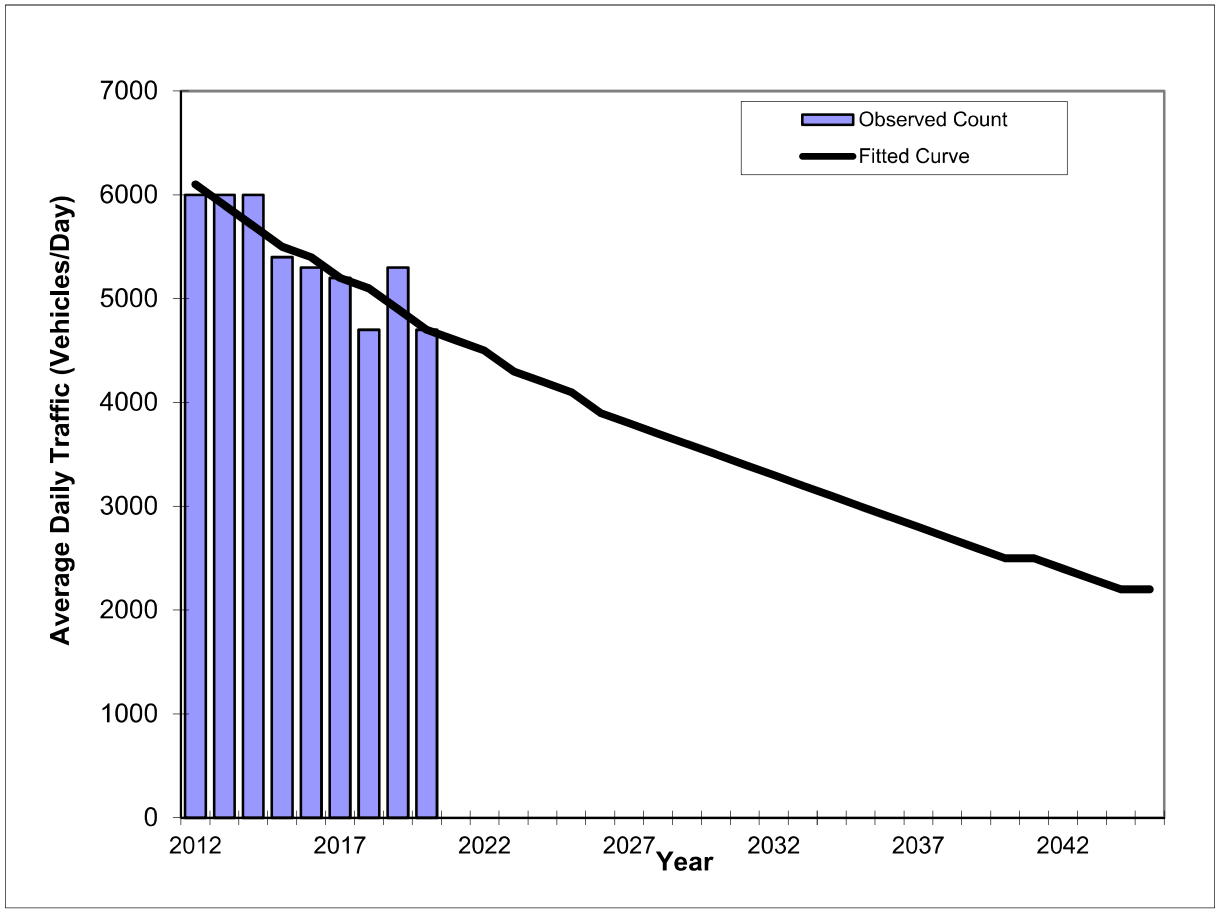
***Axle-Adjusted**

Traffic Trends - V3.0

11TH ST -- 200' EAST OF MERIDIAN CT

FIN#	0
Location	1

County:	Miami-Dade (87)
Station #:	8532
Highway:	11TH ST



Year	Traffic (ADT/AADT) Count*	Trend**
2012	6000	6100
2013	6000	5900
2014	6000	5700
2015	5400	5500
2016	5300	5400
2017	5200	5200
2018	4700	5100
2019	5300	4900
2020	4700	4700
2023 Opening Year Trend		
2023	N/A	4300
2035 Mid-Year Trend		
2035	N/A	3000
2045 Design Year Trend		
2045	N/A	2200
TRANPLAN Forecasts/Trends		

Trend R-squared:	79.37%
Compounded Annual Historic Growth Rate:	-3.21%
Compounded Growth Rate (2020 to Design Year):	-2.99%
Printed:	1-Oct-21

Exponential Growth Option

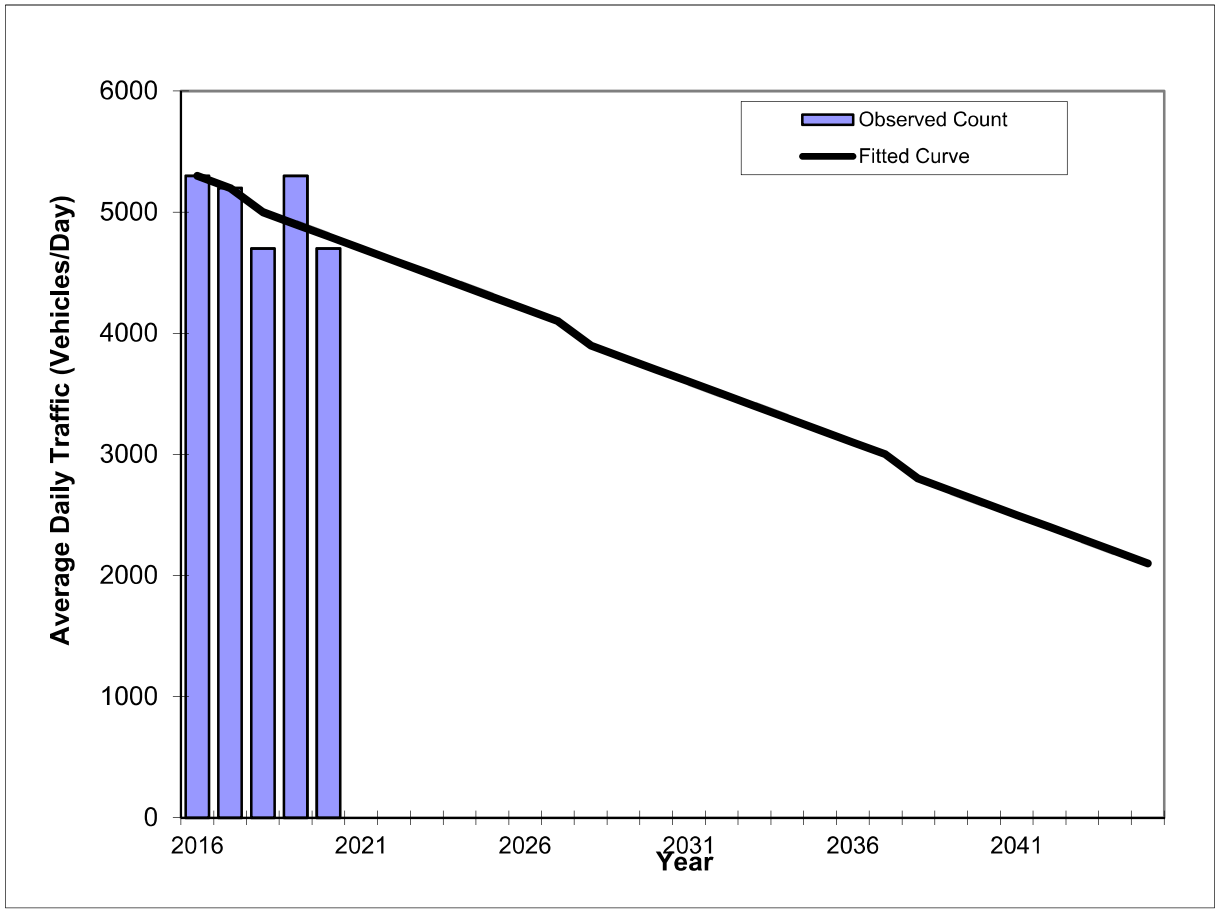
***Axle-Adjusted**

Traffic Trends - V3.0

11TH ST -- 200' EAST OF MERIDIAN CT

FIN#	0
Location	1

County:	Miami-Dade (87)
Station #:	8532
Highway:	11TH ST



Year	Traffic (ADT/AADT) Count*	Trend**
2016	5300	5300
2017	5200	5200
2018	4700	5000
2019	5300	4900
2020	4700	4800
2023 Opening Year Trend		
2023	N/A	4500
2035 Mid-Year Trend		
2035	N/A	3200
2045 Design Year Trend		
2045	N/A	2100
TRANPLAN Forecasts/Trends		

**** Annual Trend Increase:**	-110
Trend R-squared:	30.87%
Trend Annual Historic Growth Rate:	-2.36%
Trend Growth Rate (2020 to Design Year):	-2.25%
Printed:	1-Oct-21

Straight Line Growth Option

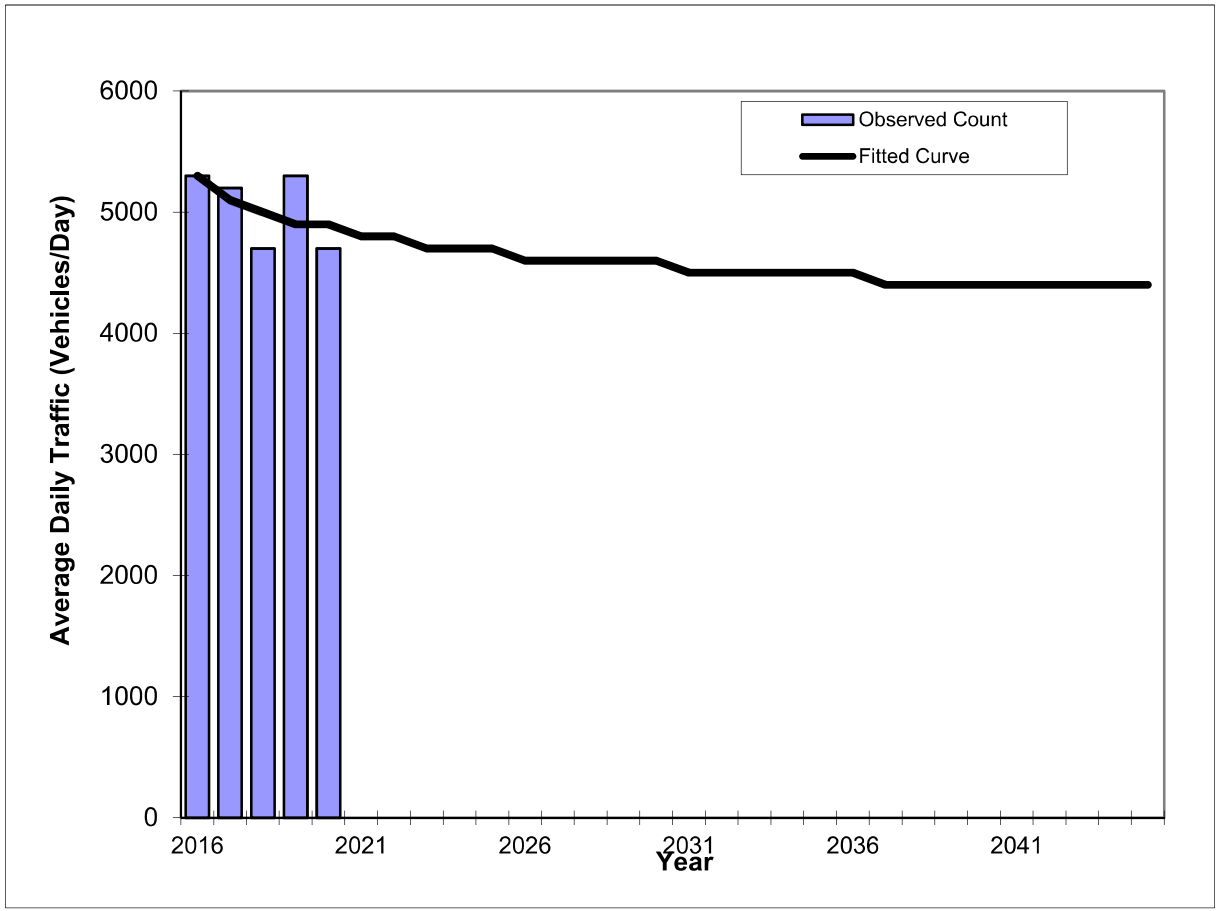
***Axle-Adjusted**

Traffic Trends - V3.0

11TH ST -- 200' EAST OF MERIDIAN CT

FIN#	0
Location	1

County:	Miami-Dade (87)
Station #:	8532
Highway:	11TH ST



Year	Traffic (ADT/AADT) Count*	Trend**
2016	5300	5300
2017	5200	5100
2018	4700	5000
2019	5300	4900
2020	4700	4900
2023 Opening Year Trend		
2023	N/A	4700
2035 Mid-Year Trend		
2035	N/A	4500
2045 Design Year Trend		
2045	N/A	4400
TRANPLAN Forecasts/Trends		

Trend R-squared:	31.89%
Compounded Annual Historic Growth Rate:	-1.94%
Compounded Growth Rate (2020 to Design Year):	-0.43%
Printed:	1-Oct-21

Decaying Exponential Growth Option

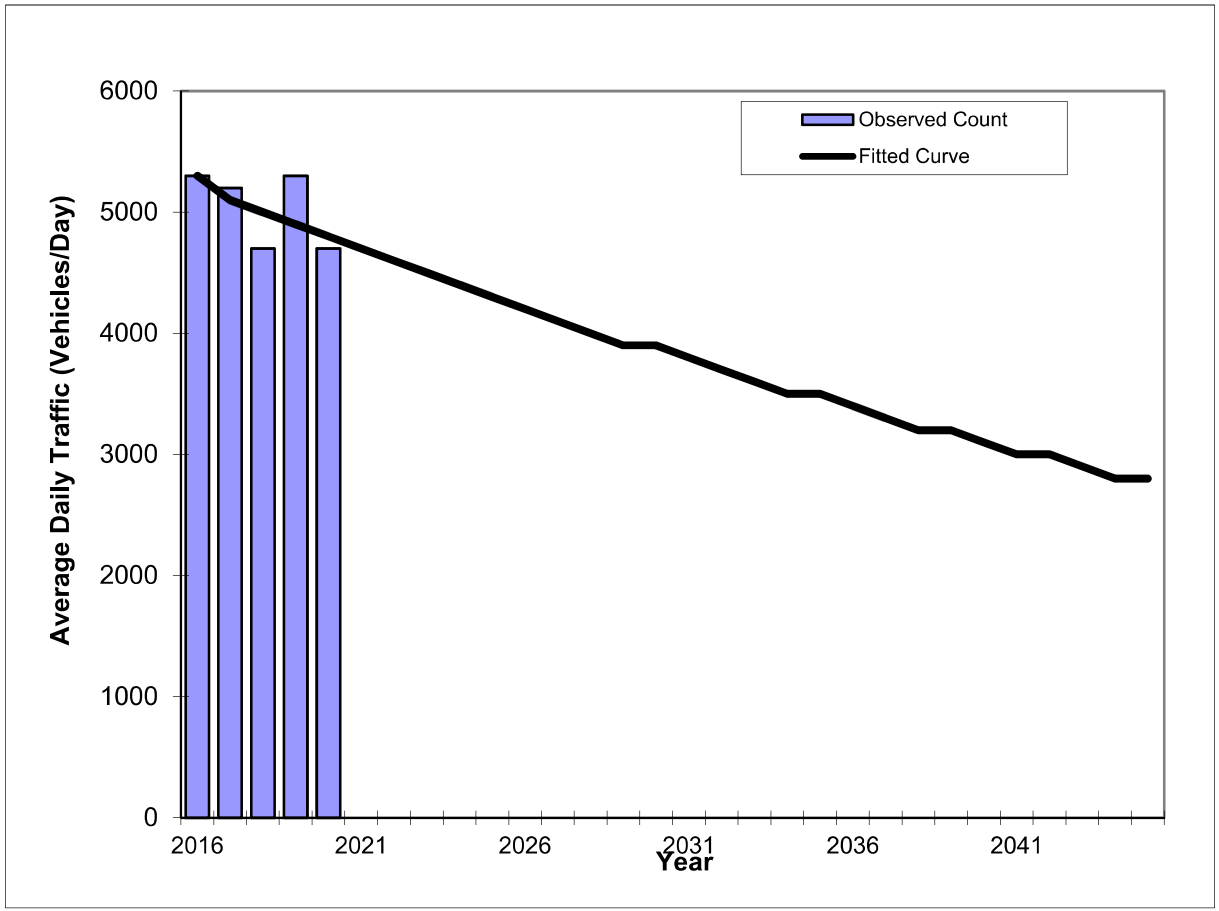
***Axle-Adjusted**

Traffic Trends - V3.0

11TH ST -- 200' EAST OF MERIDIAN CT

FIN#	0
Location	1

County:	Miami-Dade (87)
Station #:	8532
Highway:	11TH ST



Year	Traffic (ADT/AADT) Count*	Trend**
2016	5300	5300
2017	5200	5100
2018	4700	5000
2019	5300	4900
2020	4700	4800
2023 Opening Year Trend		
2023	N/A	4500
2035 Mid-Year Trend		
2035	N/A	3500
2045 Design Year Trend		
2045	N/A	2800
TRANPLAN Forecasts/Trends		

Trend R-squared:	31.02%
Compounded Annual Historic Growth Rate:	-2.45%
Compounded Growth Rate (2020 to Design Year):	-2.13%
Printed:	1-Oct-21

Exponential Growth Option

***Axle-Adjusted**

FLORIDA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION STATISTICS OFFICE
2020 HISTORICAL AADT REPORT

COUNTY: 87 - MIAMI-DADE

SITE: 8590 - S POINTE DR, 150 FT W OF WASHINGTON AVE, MIAMI BEACH

YEAR	AADT	DIRECTION 1	DIRECTION 2	*K FACTOR	D FACTOR	T FACTOR
2020	3700 F	E 1900	W 1800	9.00	56.00	4.40
2019	4100 C	E 2100	W 2000	9.00	56.00	4.00
2018	5000 T	E 2700	W 2300	9.00	54.30	3.00
2017	5600 S	E 3000	W 2600	9.00	59.30	2.50
2016	5600 F	E 3000	W 2600	9.00	56.10	5.10
2015	5600 C	E 3000	W 2600	9.00	57.40	7.10
2014	5200 S	E 2700	W 2500	9.00	59.30	10.70
2013	5200 F	E 2700	W 2500	9.00	58.90	16.20
2012	5200 C	E 2700	W 2500	9.00	59.70	16.00

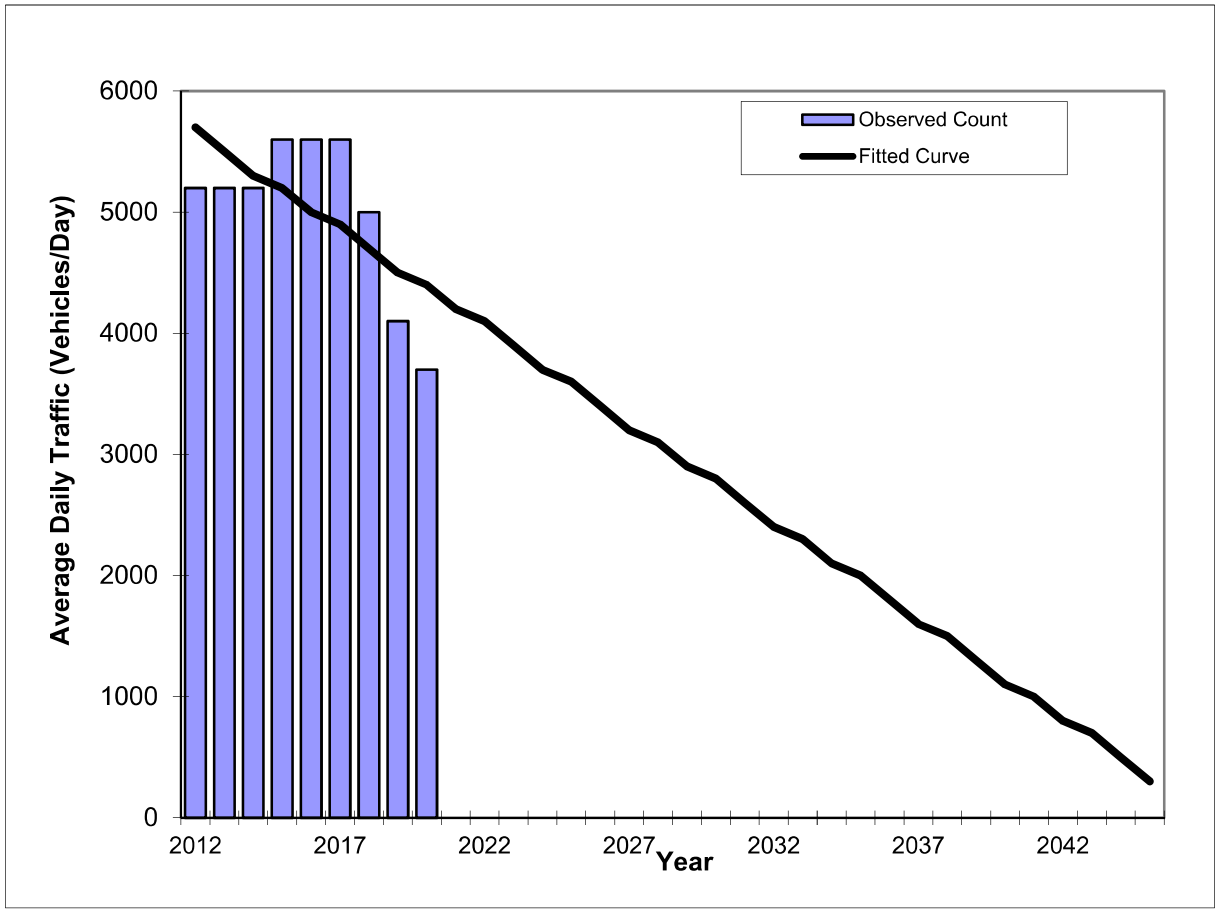
AADT FLAGS: C = COMPUTED; E = MANUAL ESTIMATE; F = FIRST YEAR ESTIMATE
S = SECOND YEAR ESTIMATE; T = THIRD YEAR ESTIMATE; R = FOURTH YEAR ESTIMATE
V = FIFTH YEAR ESTIMATE; 6 = SIXTH YEAR ESTIMATE; X = UNKNOWN
*K FACTOR: STARTING WITH YEAR 2011 IS STANDARDK, PRIOR YEARS ARE K30 VALUES

Traffic Trends - V3.0

S POINTE DR -- 150 FT W OF WASHINGTON AVE

FIN#	0
Location	1

County:	Miami-Dade (87)
Station #:	8590
Highway:	S POINTE DR



Year	Traffic (ADT/AADT) Count*	Trend**
2012	5200	5700
2013	5200	5500
2014	5200	5300
2015	5600	5200
2016	5600	5000
2017	5600	4900
2018	5000	4700
2019	4100	4500
2020	3700	4400
2023 Opening Year Trend		
2023	N/A	3900
2035 Mid-Year Trend		
2035	N/A	2000
2045 Design Year Trend		
2045	N/A	300
TRANPLAN Forecasts/Trends		

**** Annual Trend Increase:**	-162
Trend R-squared:	42.43%
Trend Annual Historic Growth Rate:	-2.85%
Trend Growth Rate (2020 to Design Year):	-3.73%
Printed:	17-Aug-21

Straight Line Growth Option

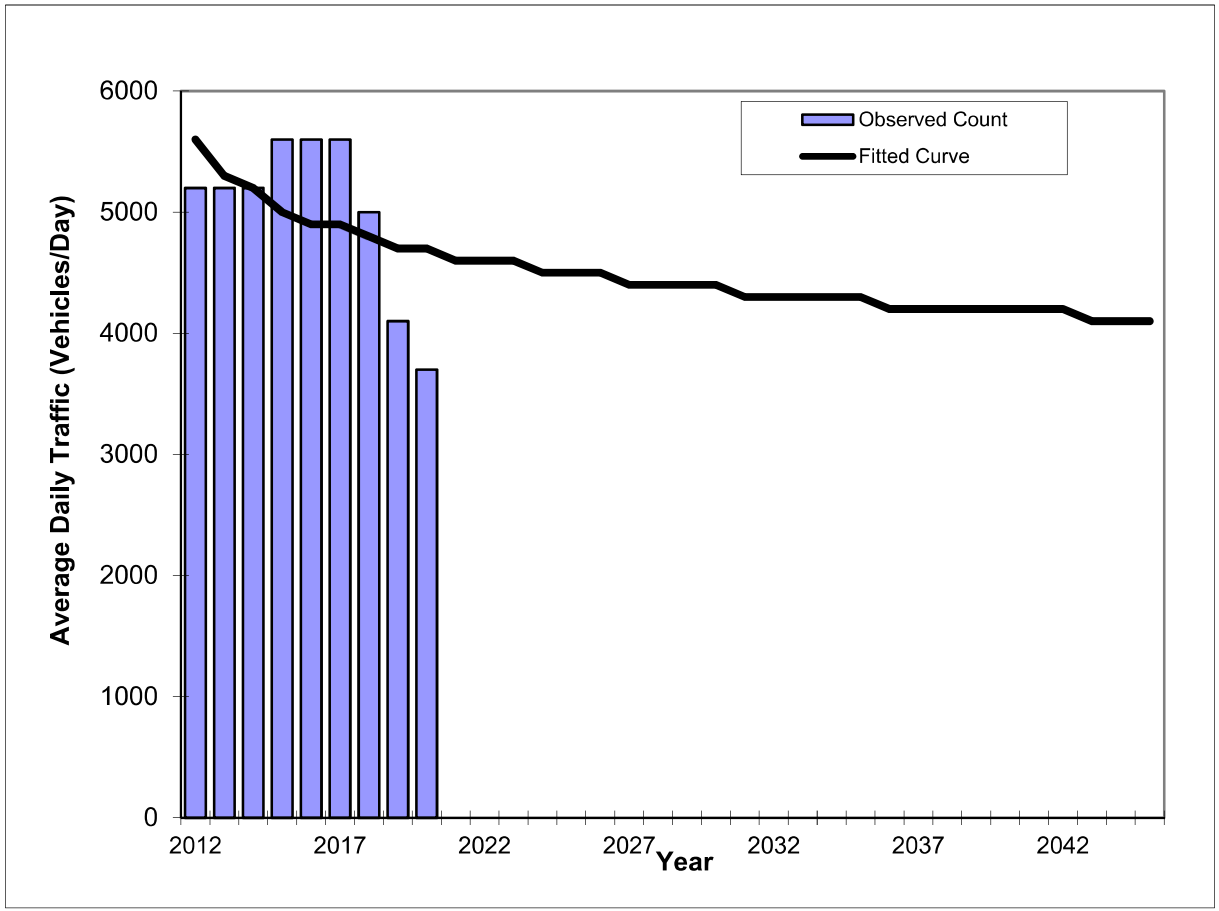
***Axle-Adjusted**

Traffic Trends - V3.0

S POINTE DR -- 150' W OF WASHINGTON AVE

FIN#	0
Location	1

County:	Miami-Dade (87)
Station #:	8590
Highway:	S POINTE DR



Year	Traffic (ADT/AADT) Count*	Trend**
2012	5200	5600
2013	5200	5300
2014	5200	5200
2015	5600	5000
2016	5600	4900
2017	5600	4900
2018	5000	4800
2019	4100	4700
2020	3700	4700
2023 Opening Year Trend		
2023	N/A	4600
2035 Mid-Year Trend		
2035	N/A	4300
2045 Design Year Trend		
2045	N/A	4100
TRANPLAN Forecasts/Trends		

Trend R-squared:	20.75%
Compounded Annual Historic Growth Rate:	-2.17%
Compounded Growth Rate (2020 to Design Year):	-0.54%
Printed:	1-Oct-21

Decaying Exponential Growth Option

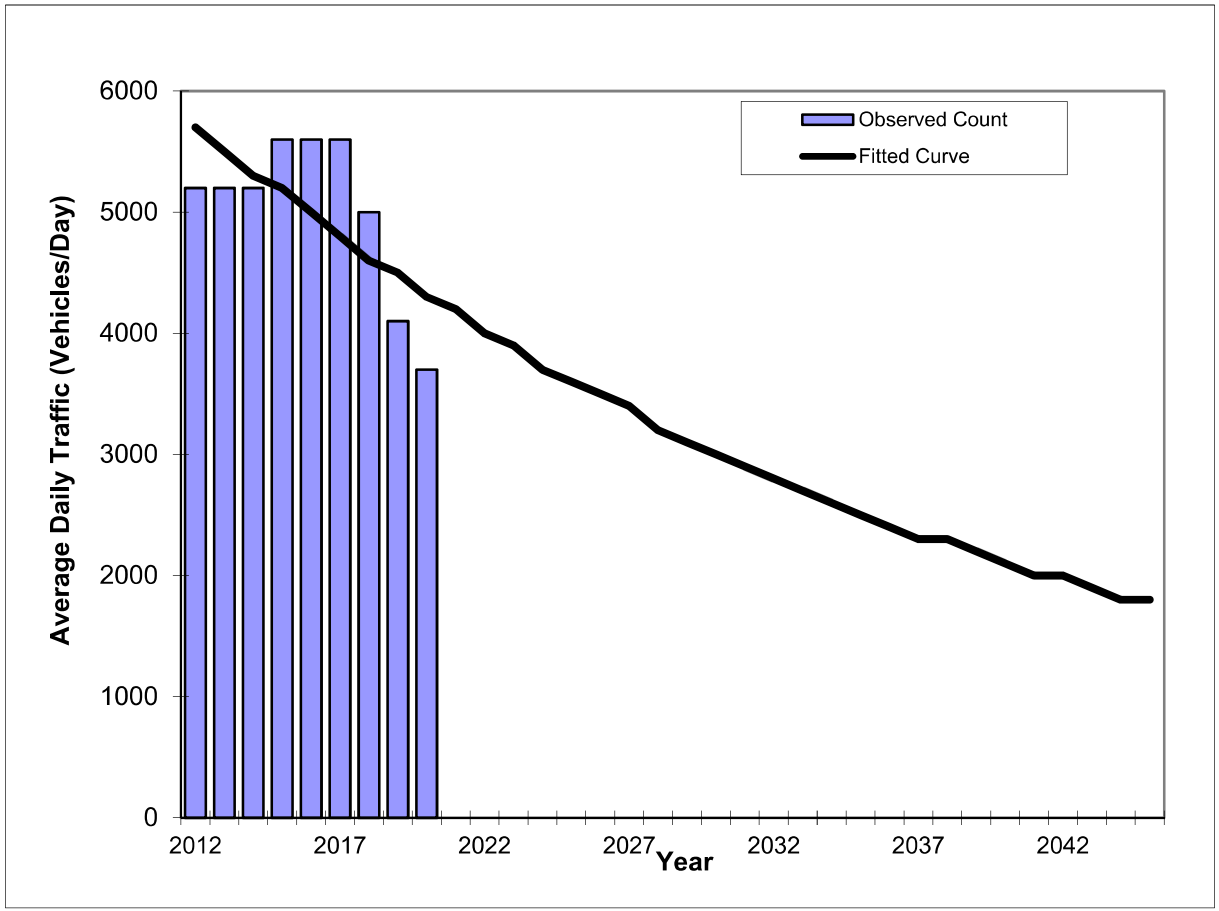
***Axle-Adjusted**

Traffic Trends - V3.0

S POINTE DR -- 150' W OF WASHINGTON AVE

FIN#	0
Location	1

County:	Miami-Dade (87)
Station #:	8590
Highway:	S POINTE DR



Year	Traffic (ADT/AADT) Count*	Trend**
2012	5200	5700
2013	5200	5500
2014	5200	5300
2015	5600	5200
2016	5600	5000
2017	5600	4800
2018	5000	4600
2019	4100	4500
2020	3700	4300
2023 Opening Year Trend		
2023	N/A	3900
2035 Mid-Year Trend		
2035	N/A	2500
2045 Design Year Trend		
2045	N/A	1800
TRANPLAN Forecasts/Trends		

Trend R-squared:	44.65%
Compounded Annual Historic Growth Rate:	-3.46%
Compounded Growth Rate (2020 to Design Year):	-3.42%
Printed:	1-Oct-21

Exponential Growth Option

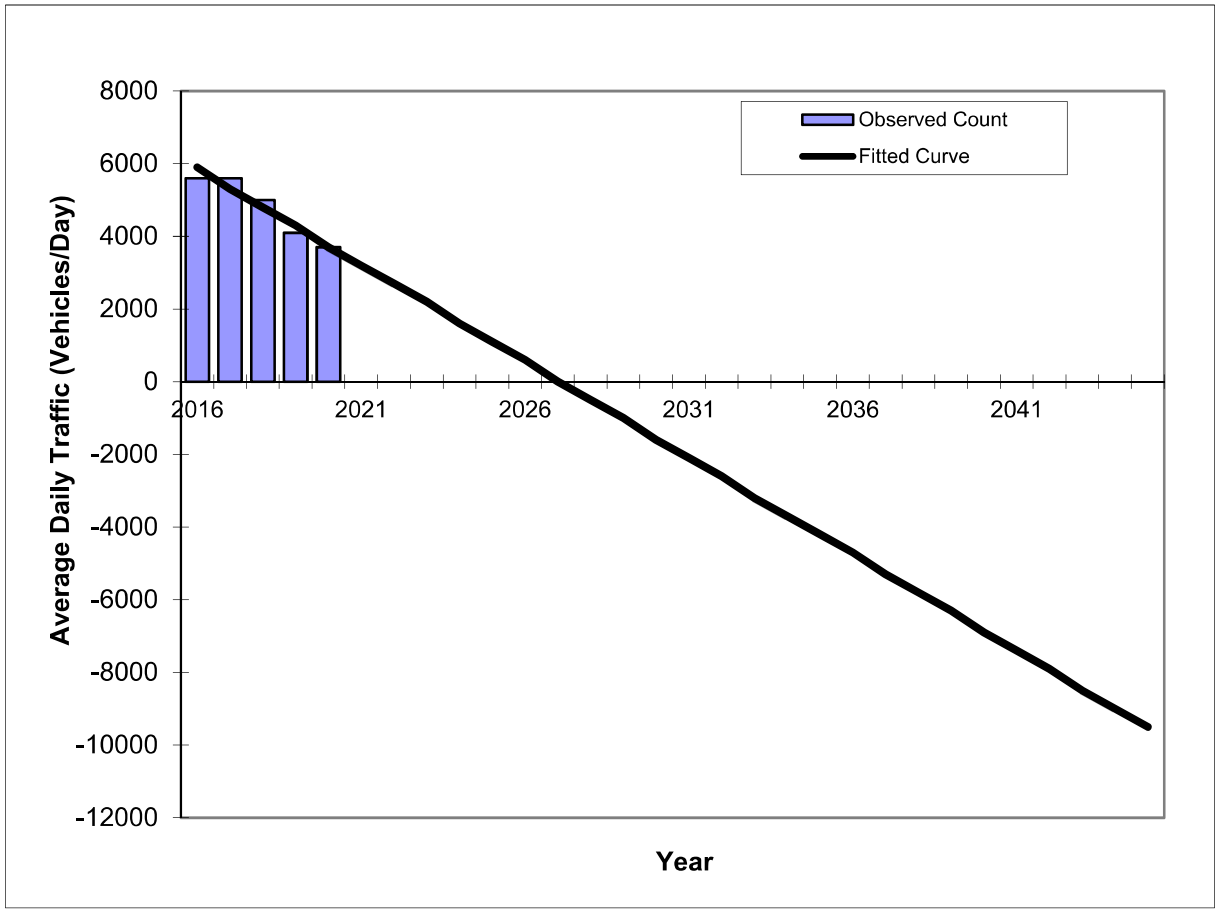
***Axle-Adjusted**

Traffic Trends - V3.0

S POINTE DR -- 150' W OF WASHINGTON AVE

FIN#	0
Location	1

County:	Miami-Dade (87)
Station #:	8590
Highway:	S POINTE DR



Year	Traffic (ADT/AADT) Count*	Trend**
2016	5600	5900
2017	5600	5300
2018	5000	4800
2019	4100	4300
2020	3700	3700
2023 Opening Year Trend		
2023	N/A	2200
2035 Mid-Year Trend		
2035	N/A	-4200
2045 Design Year Trend		
2045	N/A	-9500
TRANPLAN Forecasts/Trends		

**** Annual Trend Increase:**	-530
Trend R-squared:	93.01%
Trend Annual Historic Growth Rate:	-9.32%
Trend Growth Rate (2020 to Design Year):	-14.27%
Printed:	1-Oct-21

Straight Line Growth Option

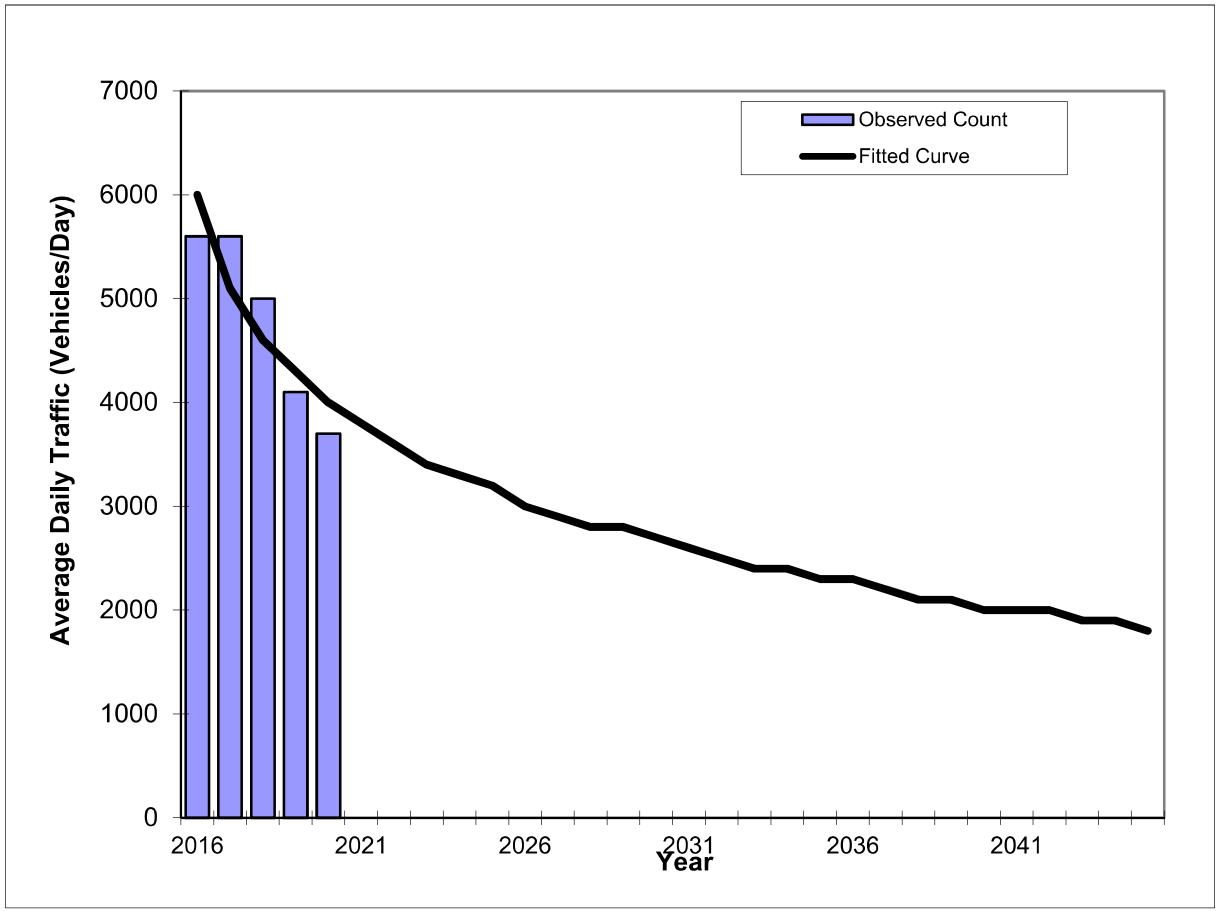
***Axle-Adjusted**

Traffic Trends - V3.0

S POINTE DR -- 150' W OF WASHINGTON AVE

FIN#	0
Location	1

County:	Miami-Dade (87)
Station #:	8590
Highway:	S POINTE DR



Year	Traffic (ADT/AADT) Count*	Trend**
2016	5600	6000
2017	5600	5100
2018	5000	4600
2019	4100	4300
2020	3700	4000
2023 Opening Year Trend		
2023	N/A	3400
2035 Mid-Year Trend		
2035	N/A	2300
2045 Design Year Trend		
2045	N/A	1800
TRANPLAN Forecasts/Trends		

Trend R-squared:	79.27%
Compounded Annual Historic Growth Rate:	-9.64%
Compounded Growth Rate (2020 to Design Year):	-3.14%
Printed:	1-Oct-21

Decaying Exponential Growth Option

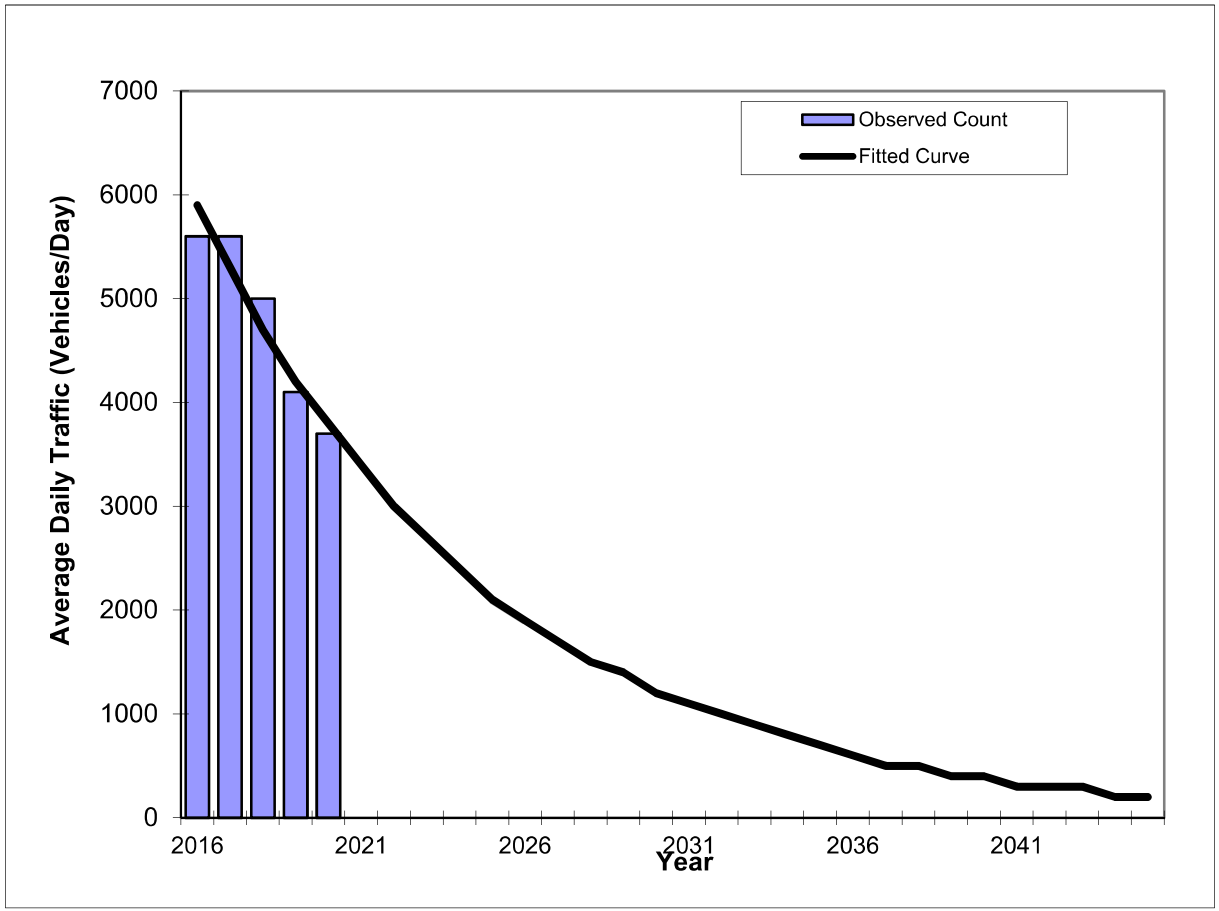
***Axle-Adjusted**

Traffic Trends - V3.0

S POINTE DR -- 150' W OF WASHINGTON AVE

FIN#	0
Location	1

County:	Miami-Dade (87)
Station #:	8590
Highway:	S POINTE DR

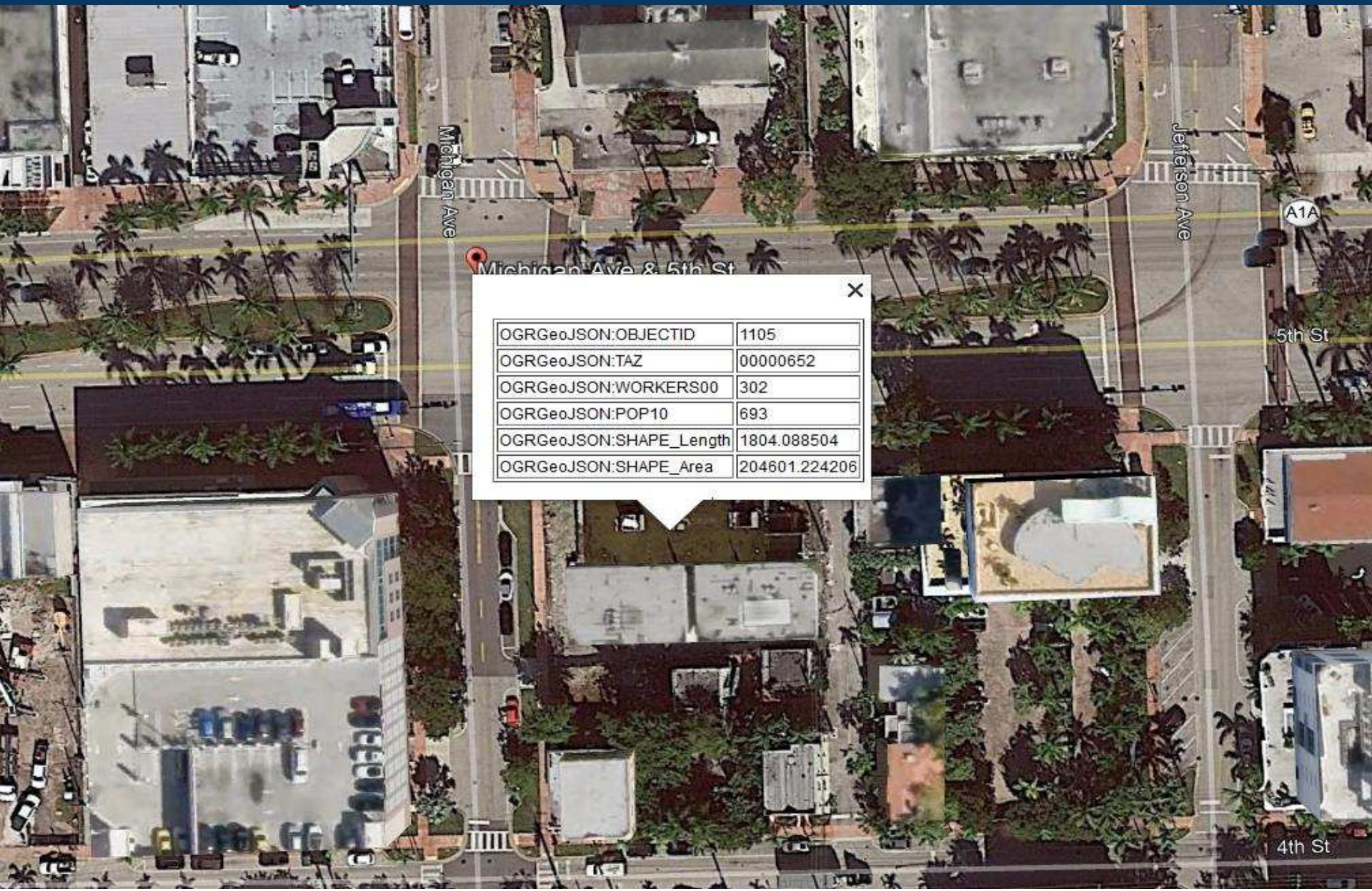


Year	Traffic (ADT/AADT) Count*	Trend**
2016	5600	5900
2017	5600	5300
2018	5000	4700
2019	4100	4200
2020	3700	3800
2023 Opening Year Trend		
2023	N/A	2700
2035 Mid-Year Trend		
2035	N/A	700
2045 Design Year Trend		
2045	N/A	200
TRANPLAN Forecasts/Trends		

Trend R-squared:	92.38%
Compounded Annual Historic Growth Rate:	-10.42%
Compounded Growth Rate (2020 to Design Year):	-11.11%
Printed:	1-Oct-21

Exponential Growth Option

***Axle-Adjusted**



Traffic Analysis Zones 2010

Miami-Dade 2015 Base Year Direction Trip Distribution Summary											
TAZ of Origin		Trips / Percent	Cardinal Directions								Total Trips
County TAZ	Regional TAZ		NNE	ENE	ESE	SSE	SSW	WSW	WNW	NNW	
651	3551	Trips	601	40	126	-	25	267	541	390	2,069
651	3551	Percent	30.2	2.0	6.3	-	1.2	13.4	27.2	19.6	
652	3552	Trips	740	133	112	92	80	539	627	907	3,332
652	3552	Percent	22.9	4.1	3.5	2.8	2.5	16.7	19.4	28.1	
653	3553	Trips	597	120	187	238	48	604	488	661	2,984
653	3553	Percent	20.3	4.1	6.4	8.1	1.6	20.5	16.6	22.5	
654	3554	Trips	648	-	246	192	190	739	849	890	3,940
654	3554	Percent	17.3	-	6.6	5.1	5.1	19.7	22.6	23.7	
655	3555	Trips	2,579	-	-	-	1,029	2,523	3,354	2,903	13,375
655	3555	Percent	20.8	-	-	-	8.3	20.4	27.1	23.4	
656	3556	Trips	683	-	-	-	187	546	1,103	960	3,541
656	3556	Percent	19.6	-	-	-	5.4	15.7	31.7	27.6	
657	3557	Trips	223	26	3	49	34	152	244	154	913
657	3557	Percent	25.2	2.9	0.4	5.5	3.8	17.2	27.6	17.4	
658	3558	Trips	385	-	74	12	19	212	362	296	1,384
658	3558	Percent	28.3	-	5.4	0.9	1.4	15.6	26.6	21.8	
659	3559	Trips	1,748	-	-	-	186	1,331	2,542	2,823	9,143
659	3559	Percent	20.3	-	-	-	2.2	15.4	29.5	32.7	
660	3560	Trips	445	-	-	-	26	214	438	582	1,786
660	3560	Percent	26.1	-	-	-	1.5	12.5	25.7	34.1	
661	3561	Trips	561	-	-	-	29	307	686	550	2,237
661	3561	Percent	26.3	-	-	-	1.4	14.4	32.2	25.8	
662	3562	Trips	247	-	-	-	367	663	1,138	583	3,054
662	3562	Percent	8.2	-	-	-	12.3	22.1	38.0	19.4	
663	3563	Trips	28	-	-	-	80	28	129	132	397
663	3563	Percent	7.1	-	-	-	20.3	7.0	32.4	33.2	
664	3564	Trips	690	1,278	-	2	5	504	1,465	2,405	8,087
664	3564	Percent	10.9	20.1	-	0.0	0.1	7.9	23.1	37.9	
665	3565	Trips	1,047	-	-	16	12	2,003	2,621	4,069	11,382
665	3565	Percent	10.7	-	-	0.2	0.1	20.5	26.8	41.7	
666	3566	Trips	7	-	-	-	-	-	40	97	144
666	3566	Percent	4.6	-	-	-	-	-	27.9	67.5	
667	3567	Trips	69	191	371	354	52	-	-	11	1,049
667	3567	Percent	6.6	18.3	35.4	33.8	5.0	-	-	1.1	
668	3568	Trips	72	316	257	156	343	-	1	27	1,181
668	3568	Percent	6.2	27.0	21.9	13.3	29.2	-	0.1	2.3	
669	3569	Trips	708	1,153	1,379	1,013	424	-	6	148	4,982
669	3569	Percent	14.7	23.9	28.6	21.0	8.8	-	0.1	3.1	
670	3570	Trips	784	1,013	1,374	915	589	74	8	172	5,078
670	3570	Percent	15.9	20.6	27.9	18.6	11.9	1.5	0.2	3.5	
671	3571	Trips	868	1,044	1,129	712	718	1	40	169	4,757
671	3571	Percent	18.5	22.3	24.1	15.2	15.4	0.0	0.9	3.6	
672	3572	Trips	262	156	186	125	162	2	24	57	974
672	3572	Percent	26.9	16.0	19.1	12.8	16.7	0.3	2.4	5.8	
673	3573	Trips	172	261	359	224	207	12	36	140	1,412
673	3573	Percent	12.2	18.5	25.4	15.9	14.6	0.8	2.6	9.9	
674	3574	Trips	866	641	1,000	863	613	112	90	488	4,718
674	3574	Percent	18.5	13.7	21.4	18.5	13.1	2.4	1.9	10.4	
675	3575	Trips	904	864	749	472	371	46	31	226	3,703
675	3575	Percent	24.7	23.6	20.5	12.9	10.1	1.3	0.9	6.2	
676	3576	Trips	43	54	19	23	31	8	-	15	194
676	3576	Percent	22.4	27.9	9.7	11.7	16.2	4.3	-	7.9	

Miami-Dade 2045 Cost Feasible Plan Direction Trip Distribution Summary											
TAZ of Origin		Trips / Percent	Cardinal Directions								Total Trips
County TAZ	Regional TAZ		NNE	ENE	ESE	SSE	SSW	WSW	WNW	NNW	
651	3551	Trips	500	33	118	-	44	610	964	424	2,777
651	3551	Percent	18.6	1.2	4.4	-	1.6	22.7	35.8	15.8	
652	3552	Trips	834	141	140	71	102	864	1,319	966	4,613
652	3552	Percent	18.8	3.2	3.2	1.6	2.3	19.5	29.7	21.8	
653	3553	Trips	563	73	181	185	40	875	1,115	522	3,691
653	3553	Percent	15.8	2.1	5.1	5.2	1.1	24.6	31.4	14.7	
654	3554	Trips	527	-	154	189	209	1,276	1,357	971	4,960
654	3554	Percent	11.3	-	3.3	4.0	4.5	27.2	29.0	20.7	
655	3555	Trips	2,507	-	-	-	984	3,119	4,529	3,116	15,245
655	3555	Percent	17.6	-	-	-	6.9	21.9	31.8	21.9	
656	3556	Trips	752	-	-	-	201	872	1,503	1,028	4,509
656	3556	Percent	17.3	-	-	-	4.6	20.0	34.5	23.6	
657	3557	Trips	255	42	13	51	17	325	482	206	1,441
657	3557	Percent	18.4	3.0	1.0	3.7	1.2	23.4	34.6	14.8	
658	3558	Trips	398	-	50	10	22	302	673	339	1,860
658	3558	Percent	22.2	-	2.8	0.6	1.2	16.8	37.5	18.9	
659	3559	Trips	1,874	-	-	-	244	1,675	3,472	2,524	10,393
659	3559	Percent	19.1	-	-	-	2.5	17.1	35.5	25.8	
660	3560	Trips	386	-	-	-	28	335	726	479	2,047
660	3560	Percent	19.8	-	-	-	1.5	17.2	37.1	24.5	
661	3561	Trips	756	-	-	-	54	536	1,539	649	3,810
661	3561	Percent	21.4	-	-	-	1.5	15.2	43.6	18.4	
662	3562	Trips	292	-	-	-	279	909	1,772	764	4,053
662	3562	Percent	7.3	-	-	-	7.0	22.6	44.1	19.0	
663	3563	Trips	23	-	-	-	29	57	119	164	393
663	3563	Percent	5.9	-	-	-	7.3	14.5	30.4	41.9	
664	3564	Trips	776	1,012	-	8	8	823	2,336	4,104	11,172
664	3564	Percent	8.6	11.2	-	0.1	0.1	9.1	25.8	45.3	
665	3565	Trips	896	-	-	16	21	1,811	3,091	5,025	12,548
665	3565	Percent	8.3	-	-	0.2	0.2	16.7	28.5	46.3	
666	3566	Trips	14	-	-	-	0	4	56	145	235
666	3566	Percent	6.4	-	-	-	0.0	2.0	25.5	66.1	
667	3567	Trips	62	202	356	394	51	-	-	12	1,076
667	3567	Percent	5.8	18.8	33.0	36.6	4.7	-	-	1.1	
668	3568	Trips	190	394	278	333	392	-	1	32	1,620
668	3568	Percent	11.7	24.3	17.2	20.6	24.2	-	0.1	2.0	
669	3569	Trips	1,117	1,381	1,871	1,307	750	-	10	135	6,631
669	3569	Percent	17.0	21.0	28.5	19.9	11.4	-	0.2	2.1	
670	3570	Trips	1,284	1,233	1,894	1,616	1,059	85	15	177	7,535
670	3570	Percent	17.4	16.8	25.7	22.0	14.4	1.2	0.2	2.4	
671	3571	Trips	1,240	959	1,638	945	797	1	46	211	5,998
671	3571	Percent	21.2	16.4	28.1	16.2	13.7	0.0	0.8	3.6	
672	3572	Trips	186	161	294	189	226	24	35	120	1,234
672	3572	Percent	15.0	13.0	23.8	15.4	18.3	1.9	2.8	9.7	
673	3573	Trips	410	361	600	469	343	30	46	233	2,524
673	3573	Percent	16.5	14.5	24.1	18.8	13.8	1.2	1.8	9.4	
674	3574	Trips	1,543	1,530	2,122	1,962	1,401	177	145	1,154	10,169
674	3574	Percent	15.4	15.3	21.2	19.6	14.0	1.8	1.4	11.5	
675	3575	Trips	896	1,067	1,015	818	747	40	74	465	5,206
675	3575	Percent	17.5	20.8	19.8	16.0	14.6	0.8	1.4	9.1	
676	3576	Trips	151	160	192	100	100	18	-	45	766
676	3576	Percent	19.8	20.9	25.1	13.1	13.0	2.3	-	5.9	

SR A1A/MACARTHUR CAUSEWAY

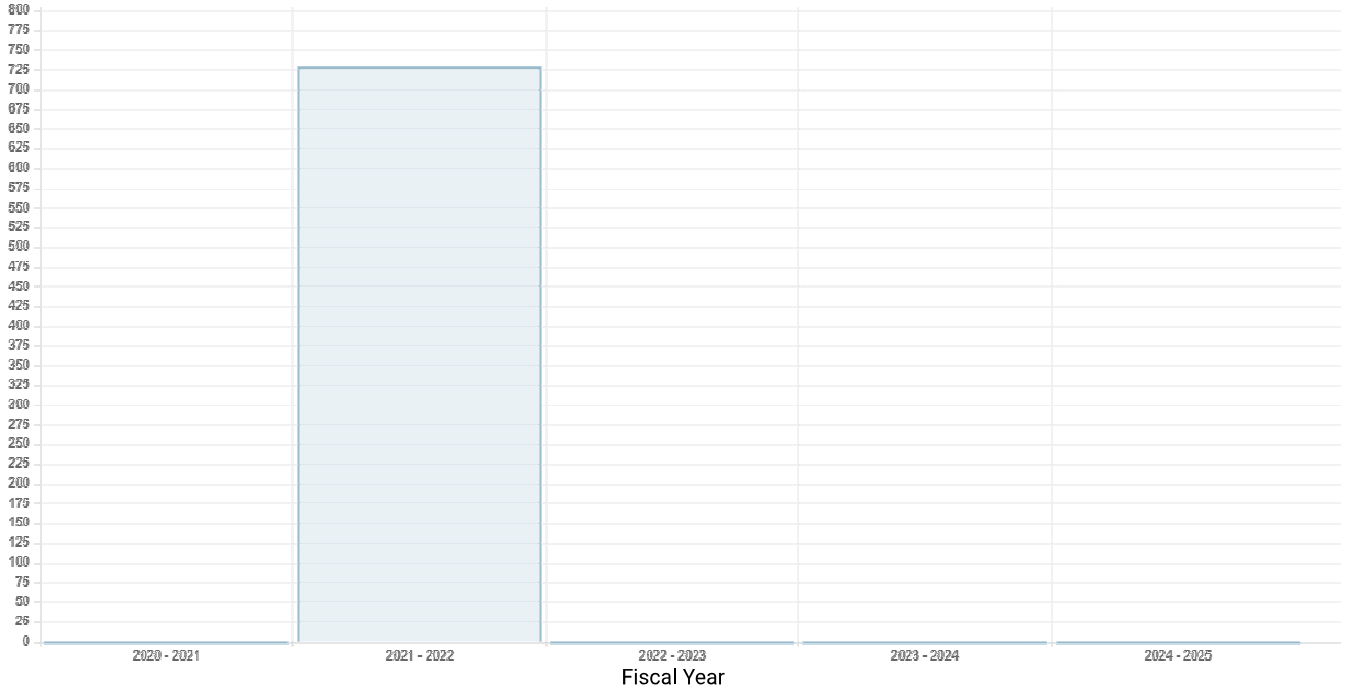
2021 Transportation Improvement Program

Project Type: Pedestrian/Bicycle
MPO Project No.: DT4434321
Type of Work: BIKE PATH/TRAIL
TIP Year: 2021
Construction Year: 2022
From: FROM SR 5/BISCAYNE BLV
To: TO SR 907/ALTON RD
Agency: FL Dept. of Transportation
Management Agency: FDOT
Agency Project No: 4434321
Status:
Contact Person:
Contact Email:
Contact Phone:
Description:

Funding Information $(thousands)

Project Phase	Funding	2020 - 2021	2021 - 2022	2022 - 2023	2023 - 2024	2024 - 2025
CONSTRUCTION	DDR	$0	$672	$0	$0	$0
CONSTRUCTION	DIH	$0	$57	$0	$0	$0
PRELIMINARY ENGINEERING	DIH	$0	$0	$0	$0	$0
PRELIMINARY ENGINEERING	DS	$0	$0	$0	$0	$0

Funding Chart $(thousands)



CITY OF MIAMI BEACH - SOUTH BEACH TROLLEY SERVICE ROUTE

2021 Transportation Improvement Program

Project Type: Transit
MPO Project No.: TA4466531
Type of Work: TRANSIT SERVICE DEMONSTRATION
TIP Year: 2021
Construction Year:
From:
To:
Agency: FL Dept. of Transportation
Management Agency: FDOT
Agency Project No: 4466531
Status:
Contact Person:
Contact Email:
Contact Phone:
Description:

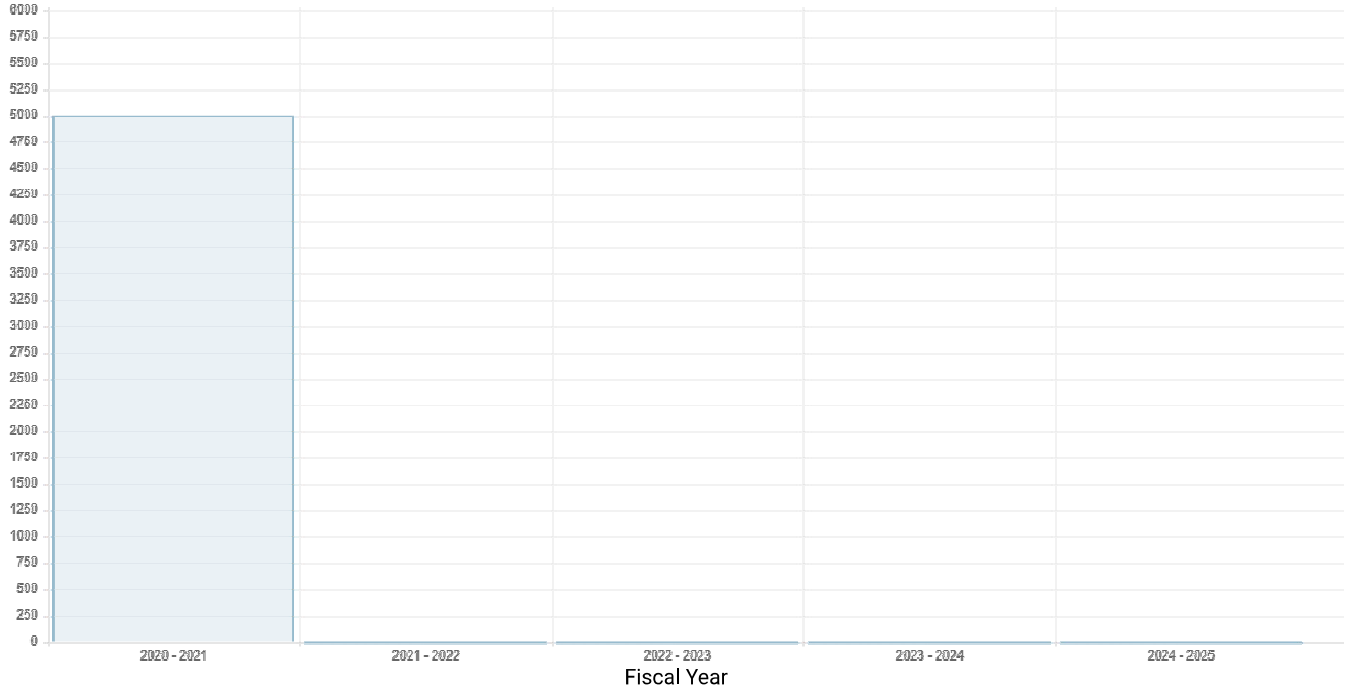
Funding Information $(thousands)

Project Phase	Funding	2020 - 2021	2021 - 2022	2022 - 2023	2023 - 2024	2024 - 2025
OPERATIONS	DPTO	$1,250	$0	$0	$0	$0
OPERATIONS	LF	$3,751	$0	$0	$0	$0

CITY OF MIAMI BEACH - SOUTH BEACH TROLLEY SERVICE ROUTE

2021 Transportation Improvement Program

Funding Chart $(thousands)



APPENDIX E
INTERSECTION VOLUME SPREADSHEETS

AM PEAK HOUR TRAFFIC VOLUME CALCULATIONS
411 MICHIGAN

Intersection	Scenario	Traffic Volumes												
		EBLT	EBT	EBRT	WBUT	WBLT	WBT	WBRT	NBLT	NBT	NBRT	SBLT	SBT	SBRT
Alton Road & 4th Street	Traffic Count	27	2	4		11	5	32	1	223	11	30	514	28
	Peak Season Conversion Factor	1.05	1.05	1.05		1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05
	COVID Factor	1.46	1.46	1.46		1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46
	2021 Peak Season Traffic	**41**	**3**	**6**		**17**	**8**	**49**	**2**	**342**	**17**	**46**	**788**	**43**
	Compound Growth Rate	0.50%	0.50%	0.50%		0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%
	Existing plus Background Growth	42	3	6		17	8	50	2	345	17	46	796	43
	Committed Development Trips													
	2023 Background Traffic	**42**	**3**	**6**		**17**	**8**	**50**	**2**	**345**	**17**	**46**	**796**	**43**
	In/Out					Out		Out			In	In		
	Project Assignment					2%		18%			2%	18%		
	Net New Project Trips	0	0	0		0	0	2	0	0	1	10	0	0
	2023 Total Traffic	**42**	**3**	**6**		**17**	**8**	**52**	**2**	**345**	**18**	**56**	**796**	**43**
Michigan Avenue & 4th Street	Traffic Count	9	17	10		2	25	15	8	26	2	6	23	2
	Peak Season Conversion Factor	1.05	1.05	1.05		1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05
	COVID Factor	1.46	1.46	1.46		1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46
	2021 Peak Season Traffic	**14**	**26**	**15**		**3**	**38**	**23**	**12**	**40**	**3**	**9**	**35**	**3**
	Compound Growth Rate	0.50%	0.50%	0.50%		0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%
	Existing plus Background Growth	14	26	15		3	39	23	12	40	3	9	36	3
	Committed Development Trips													
	2023 Background Traffic	**14**	**26**	**15**		**3**	**39**	**23**	**12**	**40**	**3**	**9**	**36**	**3**
	In/Out	In						In		In				
	Project Assignment	20%						3%		3%				
	Net New Project Trips	11	0	0		0	0	2	0	2	0	0	0	0
	In/Out					Out	Out	Out						
	Project Assignment					3%	20%	92%						
	Net New Project Trips	0	0	0		0	2	11	0	0	0	0	0	0
	Net New Project Trips	11	0	0		0	2	13	0	2	0	0	0	0
	2023 Total Traffic	**25**	**26**	**15**		**3**	**41**	**36**	**12**	**42**	**3**	**9**	**36**	**3**
Michigan Avenue & 5th Street	Traffic Count	23	711	18	0	1	561	5	22	24	5	13	19	46
	Peak Season Conversion Factor	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05
	COVID Factor	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46
	2021 Peak Season Traffic	**35**	**1,090**	**28**	**0**	**2**	**860**	**8**	**34**	**37**	**8**	**20**	**29**	**70**
	Compound Growth Rate	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%
	Existing plus Background Growth	36	1,101	28	0	2	868	8	34	37	8	20	29	71
	Committed Development Trips													
	2023 Background Traffic	**36**	**1,101**	**28**	**0**	**2**	**868**	**8**	**34**	**37**	**8**	**20**	**29**	**71**
	In/Out			In		In							In	
	Project Assignment In			35%		4%							35%	
	Net New Project Trips	0	0	19	0	2	0	0	0	0	0	0	19	0
	In/Out						Out	Out						
	Project Assignment Out						35%	35%						
	Net New Project Trips	0	0	0	0	0	4	4	0	0	0	0	0	0
	Net New Project Trips	0	0	19	0	2	4	4	0	0	0	0	19	0
	2023 Total Traffic	**36**	**1,101**	**47**	**0**	**4**	**872**	**12**	**34**	**37**	**8**	**20**	**48**	**71**

PM PEAK HOUR TRAFFIC VOLUME CALCULATIONS
411 MICHIGAN

Intersection	Scenario	Traffic Volumes												
		EBLT	EBT	EBRT	WBUT	WBLT	WBT	WBRT	NBLT	NBT	NBRT	SBLT	SBT	SBRT
Alton Road & 4th Street	Traffic Count	37	12	7		20	5	52	5	589	13	44	518	37
	Peak Season Conversion Factor	1.05	1.05	1.05		1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05
	COVID Factor	1.62	1.62	1.62		1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62
	2021 Peak Season Traffic	**63**	**20**	**12**		**34**	**8**	**88**	**8**	**1,000**	**22**	**75**	**879**	**63**
	Compound Growth Rate	0.50%	0.50%	0.50%		0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%
	Existing plus Background Growth	63	21	12		34	9	89	9	1,010	22	75	888	63
	Committed Development Trips													
	2023 Background Traffic	**63**	**21**	**12**		**34**	**9**	**89**	**9**	**1,010**	**22**	**75**	**888**	**63**
	In/Out					Out		Out			In	In		
	Project Assignment					2%		18%			2%	18%		
	Net New Project Trips	0	0	0		1	0	12	0	0	1	5	0	0
	2023 Total Traffic	**63**	**21**	**12**		**35**	**9**	**101**	**9**	**1,010**	**23**	**80**	**888**	**63**
Michigan Avenue & 4th Street	Traffic Count	5	46	10		4	67	19	13	37	2	10	32	8
	Peak Season Conversion Factor	1.05	1.05	1.05		1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05
	COVID Factor	1.62	1.62	1.62		1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62
	2021 Peak Season Traffic	**8**	**78**	**17**		**7**	**114**	**32**	**22**	**63**	**3**	**17**	**54**	**14**
	Compound Growth Rate	0.50%	0.50%	0.50%		0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%
	Existing plus Background Growth	9	79	17		7	115	33	22	63	3	17	55	14
	Committed Development Trips													
	2023 Background Traffic	**9**	**79**	**17**		**7**	**115**	**33**	**22**	**63**	**3**	**17**	**55**	**14**
	In/Out	In						In		In				
	Project Assignment	20%						3%		3%				
	Net New Project Trips	5	0	0		0	0	1	0	1	0	0	0	0
	In/Out					Out	Out	Out						
	Project Assignment					3%	20%	92%						
	Net New Project Trips	0	0	0		2	13	60	0	0	0	0	0	0
		5	0	0		2	13	61	0	1	0	0	0	0
	2023 Total Traffic	**14**	**79**	**17**		**9**	**128**	**94**	**22**	**64**	**3**	**17**	**55**	**14**
Michigan Avenue & 5th Street	Traffic Count	66	762	21	0	6	1,043	24	26	21	9	7	21	68
	Peak Season Conversion Factor	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05
	COVID Factor	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62
	2021 Peak Season Traffic	**112**	**1,293**	**36**	**0**	**10**	**1,770**	**41**	**44**	**36**	**15**	**12**	**36**	**115**
	Compound Growth Rate	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%
	Existing plus Background Growth	113	1,306	36	0	10	1,788	41	45	36	15	12	36	117
	Committed Development Trips													
	2023 Background Traffic	**113**	**1,306**	**36**	**0**	**10**	**1,788**	**41**	**45**	**36**	**15**	**12**	**36**	**117**
	In/Out			In		In							In	
	Project Assignment In			35%		4%							35%	
	Net New Project Trips	0	0	9	0	1	0	0	0	0	0	0	9	0
	In/Out						Out	Out						
	Project Assignment Out						35%	35%						
	Net New Project Trips	0	0	0	0	0	23	23	0	0	0	0	0	0
	Net New Project Trips	0	0	9	0	1	23	23	0	0	0	0	9	0
	2023 Total Traffic	**113**	**1,306**	**45**	**0**	**11**	**1,811**	**64**	**45**	**36**	**15**	**12**	**45**	**117**

APPENDIX F
INTERSECTION CAPACITY REPORTS

EXISTING CONDITIONS

Table 1.1 - 2021 Existing Intersection Capacity Analysis Summary

Movement/Approach	Time	Level of Service[1]					
		Alton Road & 4th Street		Michigan Avenue & 4th Street		Michigan Avenue & 5th Street	
		LOS	Delay	LOS	Delay	LOS	Delay
EBL	AM	F	81.2			A	3.9
	PM	F	82.2			A	8.0
EBT	AM	A	0.0			C	26.6
	PM	A	0.0			A	6.5
EBR	AM	A	0.0			C	26.9
	PM	A	0.0			A	6.8
EB Approach	AM	F	81.2	A	7.5	C	26.0
	PM	F	82.2	A	8.4	A	6.7
WBL	AM	F	81.3			A	7.1
	PM	F	80.6			A	5.0
WBT	AM	A	0.0			A	5.6
	PM	A	0.0			A	8.4
WBR	AM	A	0.0			A	5.8
	PM	A	0.0			A	9.0
WB Approach	AM	F	81.3	A	7.5	A	5.7
	PM	F	80.6	A	8.7	A	8.6
NBL	AM	A	9.7			F	83.6
	PM	B	10.5			E	78.2
NBT	AM	A	6.1			A	0.0
	PM	B	10.1			A	0.0
NBR	AM	A	6.1			A	0.0
	PM	B	10.0			A	0.0
NB Approach	AM	A	6.1	A	7.7	F	83.6
	PM	B	10.0	A	8.5	E	78.2
SBL	AM	A	4.4			E	77.5
	PM	A	7.2			E	71.3
SBT	AM	C	32.0			A	0.0
	PM	C	33.9			A	0.0
SBR	AM	C	31.9			E	75.7
	PM	C	33.9			E	72.9
SB Approach	AM	C	30.5	A	7.6	E	76.4
	PM	C	31.9	A	8.4	E	72.5
Overall	AM	C	28.7			C	22.8
	PM	C	26.9			B	12.7

[1] Delay is average delay per vehicle in seconds

Table 1.2 - 2021 Existing Intersection Queue Lengths Summary

Location	Time	95th Percentile Queue Lenghts (ft)															
		EBL		EBR		WBL		WBR		NBL		NBR		SBL		SBR	
		Storage (ft)	95th %tile	Storage (ft)	95th %tile	Storage (ft)	95th %tile	Storage (ft)	95th %tile	Storage (ft)	95th %tile	Storage (ft)	95th %tile	Storage (ft)	95th %tile	Storage (ft)	95th %tile
Alton Road & 4th Street	AM									62	2			124	18		
	PM										7				37		
Michigan Avenue & 4th Street	AM																
	PM																
Michigan Avenue & 5th Street	AM	140	16			155	2									58	51
	PM		68				7										153

 # 95th percentile volume exceeds capacity, queue may be longer.

m Volume for 95th percentile queue is metered by upstream signal.

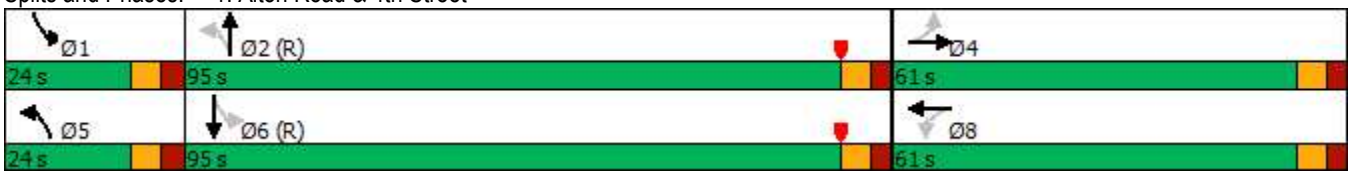
LANGAN
ENGINEERING & ENVIRONMENTAL SERVICES

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	41	3	17	8	2	342	46	788
Future Volume (vph)	41	3	17	8	2	342	46	788
Lane Group Flow (vph)	0	66	0	97	3	472	61	1094
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	pm+pt	NA
Protected Phases		4		8	5	2	1	6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	5	2	1	6
Switch Phase								
Minimum Initial (s)	7.0	7.0	5.0	5.0	5.0	7.0	5.0	7.0
Minimum Split (s)	25.0	25.0	25.0	25.0	12.0	25.0	14.0	25.0
Total Split (s)	61.0	61.0	61.0	61.0	24.0	95.0	24.0	95.0
Total Split (%)	33.9%	33.9%	33.9%	33.9%	13.3%	52.8%	13.3%	52.8%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)		0.0		0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		7.0		7.0	7.0	7.0	7.0	7.0
Lead/Lag					Lead	Lag	Lead	Lag
Lead-Lag Optimize?					Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	C-Max	None	C-Max
v/c Ratio		0.80		0.56	0.01	0.18	0.09	0.38
Control Delay		131.0		47.7	3.0	6.3	3.1	5.1
Queue Delay		0.0		0.0	0.0	0.0	0.0	1.3
Total Delay		131.0		47.7	3.0	6.3	3.1	6.3
Queue Length 50th (ft)		72		47	1	78	11	151
Queue Length 95th (ft)		109		83	2	85	18	212
Internal Link Dist (ft)		161		515		1023		369
Turn Bay Length (ft)					62		124	
Base Capacity (vph)		291		490	512	2644	767	2854
Starvation Cap Reductn		0		0	0	0	0	1457
Spillback Cap Reductn		0		0	0	0	0	0
Storage Cap Reductn		0		0	0	0	0	0
Reduced v/c Ratio		0.23		0.20	0.01	0.18	0.08	0.78

Intersection Summary

Cycle Length: 180
Actuated Cycle Length: 180
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
Natural Cycle: 65
Control Type: Actuated-Coordinated

Splits and Phases: 1: Alton Road & 4th Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	41	3	6	17	8	49	2	342	17	46	788	43
Future Volume (veh/h)	41	3	6	17	8	49	2	342	17	46	788	43
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.95		0.92	0.95		0.90	1.00		0.96	0.99		0.96
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	54	4	8	22	11	64	3	450	22	61	1037	57
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	116	10	12	49	26	99	319	2603	127	748	2661	146
Arrive On Green	0.09	0.09	0.09	0.09	0.09	0.09	0.00	0.76	0.76	0.01	0.26	0.26
Sat Flow, veh/h	842	104	130	263	281	1055	1767	3414	166	1767	3389	186
Grp Volume(v), veh/h	66	0	0	97	0	0	3	232	240	61	539	555
Grp Sat Flow(s),veh/h/ln	1076	0	0	1599	0	0	1767	1763	1817	1767	1763	1812
Q Serve(g_s), s	1.6	0.0	0.0	0.0	0.0	0.0	0.1	6.5	6.5	1.3	45.4	45.4
Cycle Q Clear(g_c), s	11.8	0.0	0.0	10.1	0.0	0.0	0.1	6.5	6.5	1.3	45.4	45.4
Prop In Lane	0.82		0.12	0.23		0.66	1.00		0.09	1.00		0.10
Lane Grp Cap(c), veh/h	138	0	0	175	0	0	319	1344	1386	748	1384	1423
V/C Ratio(X)	0.48	0.00	0.00	0.55	0.00	0.00	0.01	0.17	0.17	0.08	0.39	0.39
Avail Cap(c_a), veh/h	404	0	0	470	0	0	479	1344	1386	868	1384	1423
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	79.3	0.0	0.0	78.6	0.0	0.0	9.7	5.8	5.8	4.3	31.1	31.1
Incr Delay (d2), s/veh	1.9	0.0	0.0	2.7	0.0	0.0	0.0	0.3	0.3	0.0	0.8	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.1	0.0	0.0	4.5	0.0	0.0	0.0	2.5	2.6	0.5	22.0	22.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	81.2	0.0	0.0	81.3	0.0	0.0	9.7	6.1	6.1	4.4	32.0	31.9
LnGrp LOS	F	A	A	F	A	A	A	A	A	A	C	C
Approach Vol, veh/h		66			97			475			1155	
Approach Delay, s/veh		81.2			81.3			6.1			30.5	
Approach LOS		F			F			A			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	11.8	144.3		24.0	7.7	148.3		24.0				
Change Period (Y+Rc), s	7.0	7.0		7.0	7.0	7.0		7.0				
Max Green Setting (Gmax), s	17.0	88.0		54.0	17.0	88.0		54.0				
Max Q Clear Time (g_c+I1), s	3.3	8.5		13.8	2.1	47.4		12.1				
Green Ext Time (p_c), s	0.1	2.5		0.3	0.0	2.7		0.7				

Intersection Summary												
HCM 6th Ctrl Delay			28.7									
HCM 6th LOS			C									

Intersection	
Intersection Delay, s/veh	7.6
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	14	26	15	3	38	23	12	40	3	9	35	3
Future Vol, veh/h	14	26	15	3	38	23	12	40	3	9	35	3
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	17	31	18	4	45	27	14	48	4	11	42	4
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	7.5	7.5	7.7	7.6
HCM LOS	A	A	A	A

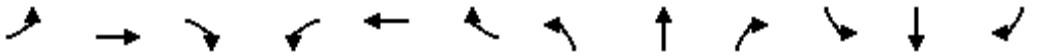
Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	22%	25%	5%	19%
Vol Thru, %	73%	47%	59%	74%
Vol Right, %	5%	27%	36%	6%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	55	55	64	47
LT Vol	12	14	3	9
Through Vol	40	26	38	35
RT Vol	3	15	23	3
Lane Flow Rate	65	65	76	56
Geometry Grp	1	1	1	1
Degree of Util (X)	0.077	0.075	0.085	0.066
Departure Headway (Hd)	4.251	4.108	4.005	4.247
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	832	860	882	832
Service Time	2.331	2.191	2.088	2.33
HCM Lane V/C Ratio	0.078	0.076	0.086	0.067
HCM Control Delay	7.7	7.5	7.5	7.6
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.2	0.2	0.3	0.2

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	35	1090	2	860	34	37	20	29	70
Future Volume (vph)	35	1090	2	860	34	37	20	29	70
Lane Group Flow (vph)	39	1242	2	965	0	88	0	54	78
Turn Type	pm+pt	NA	pm+pt	NA	Perm	NA	Perm	NA	pm+ov
Protected Phases	5	2	1	6		8		4	5
Permitted Phases	2		6		8		4		4
Detector Phase	5	2	1	6	8	8	4	4	5
Switch Phase									
Minimum Initial (s)	5.0	7.0	5.0	7.0	7.0	7.0	7.0	7.0	5.0
Minimum Split (s)	11.0	24.0	12.0	24.0	25.0	25.0	25.0	25.0	11.0
Total Split (s)	18.0	108.0	12.0	102.0	60.0	60.0	60.0	60.0	18.0
Total Split (%)	10.0%	60.0%	6.7%	56.7%	33.3%	33.3%	33.3%	33.3%	10.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	3.0	2.0	3.0	3.0	3.0	3.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0		0.0	0.0
Total Lost Time (s)	6.0	6.0	7.0	6.0		7.0		7.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag					Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes					Yes
Recall Mode	None	C-Max	None	C-Max	None	None	None	None	None
v/c Ratio	0.09	0.30	0.01	0.25		0.69		0.46	0.31
Control Delay	3.2	4.2	3.5	5.8		103.3		89.4	14.7
Queue Delay	0.0	0.0	0.0	0.0		0.0		0.0	0.0
Total Delay	3.2	4.2	3.5	5.8		103.3		89.4	14.7
Queue Length 50th (ft)	6	91	0	100		100		62	0
Queue Length 95th (ft)	16	189	2	139		161		110	51
Internal Link Dist (ft)		763		1859		253		306	
Turn Bay Length (ft)	140		155						58
Base Capacity (vph)	505	4158	345	3925		442		419	303
Starvation Cap Reductn	0	0	0	0		0		0	0
Spillback Cap Reductn	0	0	0	0		0		0	0
Storage Cap Reductn	0	0	0	0		0		0	0
Reduced v/c Ratio	0.08	0.30	0.01	0.25		0.20		0.13	0.26

Intersection Summary

Cycle Length: 180
Actuated Cycle Length: 180
Offset: 128 (71%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow
Natural Cycle: 65
Control Type: Actuated-Coordinated

Splits and Phases: 3: Michigan Avenue & 5th Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	35	1090	28	2	860	8	34	37	8	20	29	70
Future Volume (veh/h)	35	1090	28	2	860	8	34	37	8	20	29	70
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.96	1.00		0.98	0.97		0.95	0.98		0.94
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	39	1211	31	2	956	9	38	41	9	22	32	78
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	502	4031	103	313	4030	38	68	65	12	72	94	174
Arrive On Green	0.01	0.26	0.26	0.00	0.78	0.78	0.09	0.09	0.09	0.09	0.09	0.09
Sat Flow, veh/h	1767	5073	130	1767	5174	49	425	710	129	480	1020	1484
Grp Volume(v), veh/h	39	806	436	2	624	341	88	0	0	54	0	78
Grp Sat Flow(s),veh/h/ln	1767	1689	1826	1767	1689	1845	1264	0	0	1500	0	1484
Q Serve(g_s), s	0.8	34.4	34.4	0.0	9.0	9.0	7.3	0.0	0.0	0.0	0.0	8.8
Cycle Q Clear(g_c), s	0.8	34.4	34.4	0.0	9.0	9.0	12.9	0.0	0.0	5.7	0.0	8.8
Prop In Lane	1.00		0.07	1.00		0.03	0.43		0.10	0.41		1.00
Lane Grp Cap(c), veh/h	502	2683	1451	313	2631	1438	145	0	0	166	0	174
V/C Ratio(X)	0.08	0.30	0.30	0.01	0.24	0.24	0.61	0.00	0.00	0.33	0.00	0.45
Avail Cap(c_a), veh/h	578	2683	1451	357	2631	1438	448	0	0	488	0	474
HCM Platoon Ratio	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	3.9	26.3	26.3	7.1	5.4	5.4	80.6	0.0	0.0	76.6	0.0	74.3
Incr Delay (d2), s/veh	0.0	0.3	0.5	0.0	0.2	0.4	3.1	0.0	0.0	0.8	0.0	1.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	15.8	17.2	0.0	3.1	3.5	4.2	0.0	0.0	2.4	0.0	3.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	3.9	26.6	26.9	7.1	5.6	5.8	83.6	0.0	0.0	77.5	0.0	75.7
LnGrp LOS	A	C	C	A	A	A	F	A	A	E	A	E
Approach Vol, veh/h		1281			967			88			132	
Approach Delay, s/veh		26.0			5.7			83.6			76.4	
Approach LOS		C			A			F			E	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	7.5	149.0		23.5	10.3	146.2		23.5				
Change Period (Y+Rc), s	7.0	6.0		7.0	6.0	6.0		7.0				
Max Green Setting (Gmax), s	5.0	102.0		53.0	12.0	96.0		53.0				
Max Q Clear Time (g_c+I1), s	2.0	36.4		10.8	2.8	11.0		14.9				
Green Ext Time (p_c), s	0.0	3.2		0.5	0.0	2.3		0.4				

Intersection Summary												
HCM 6th Ctrl Delay			22.8									
HCM 6th LOS			C									

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	63	20	34	8	8	1000	75	879
Future Volume (vph)	63	20	34	8	8	1000	75	879
Lane Group Flow (vph)	0	105	0	145	9	1135	83	1047
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	pm+pt	NA
Protected Phases		4		8	5	2	1	6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	5	2	1	6
Switch Phase								
Minimum Initial (s)	7.0	7.0	5.0	5.0	5.0	7.0	5.0	7.0
Minimum Split (s)	25.0	25.0	25.0	25.0	12.0	25.0	14.0	25.0
Total Split (s)	61.0	61.0	61.0	61.0	24.0	95.0	24.0	95.0
Total Split (%)	33.9%	33.9%	33.9%	33.9%	13.3%	52.8%	13.3%	52.8%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)		0.0		0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		7.0		7.0	7.0	7.0	7.0	7.0
Lead/Lag					Lead	Lag	Lead	Lag
Lead-Lag Optimize?					Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	C-Max	None	C-Max
v/c Ratio		0.99		0.68	0.02	0.45	0.23	0.39
Control Delay		158.5		59.5	4.6	11.0	5.5	7.8
Queue Delay		0.0		0.0	0.0	0.0	0.0	1.9
Total Delay		158.5		59.5	4.6	11.0	5.5	9.6
Queue Length 50th (ft)		~123		99	2	256	17	151
Queue Length 95th (ft)		#209		176	7	373	37	314
Internal Link Dist (ft)		161		515		1023		369
Turn Bay Length (ft)					62		124	
Base Capacity (vph)		278		471	506	2545	442	2701
Starvation Cap Reductn		0		0	0	0	0	1435
Spillback Cap Reductn		0		0	0	0	0	0
Storage Cap Reductn		0		0	0	0	0	0
Reduced v/c Ratio		0.38		0.31	0.02	0.45	0.19	0.83

Intersection Summary

Cycle Length: 180
Actuated Cycle Length: 180
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
Natural Cycle: 70
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Alton Road & 4th Street

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	63	20	12	34	8	88	8	1000	22	75	879	63
Future Volume (veh/h)	63	20	12	34	8	88	8	1000	22	75	879	63
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.92	1.00		0.92	1.00		0.96	1.00		0.96
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	70	22	13	38	9	98	9	1111	24	83	977	70
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	109	32	15	66	21	128	331	2600	56	392	2510	180
Arrive On Green	0.12	0.12	0.12	0.12	0.12	0.12	0.01	0.74	0.74	0.01	0.25	0.25
Sat Flow, veh/h	637	274	129	347	174	1085	1767	3524	76	1767	3325	238
Grp Volume(v), veh/h	105	0	0	145	0	0	9	556	579	83	518	529
Grp Sat Flow(s),veh/h/ln	1039	0	0	1606	0	0	1767	1763	1838	1767	1763	1800
Q Serve(g_s), s	3.2	0.0	0.0	0.0	0.0	0.0	0.2	21.7	21.7	2.1	44.0	44.0
Cycle Q Clear(g_c), s	18.7	0.0	0.0	15.6	0.0	0.0	0.2	21.7	21.7	2.1	44.0	44.0
Prop In Lane	0.67		0.12	0.26		0.68	1.00		0.04	1.00		0.13
Lane Grp Cap(c), veh/h	156	0	0	215	0	0	331	1301	1356	392	1331	1359
V/C Ratio(X)	0.67	0.00	0.00	0.67	0.00	0.00	0.03	0.43	0.43	0.21	0.39	0.39
Avail Cap(c_a), veh/h	405	0	0	477	0	0	480	1301	1356	510	1331	1359
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	78.5	0.0	0.0	76.9	0.0	0.0	10.5	9.0	9.0	6.9	33.1	33.1
Incr Delay (d2), s/veh	3.7	0.0	0.0	3.7	0.0	0.0	0.0	1.0	1.0	0.3	0.9	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.0	0.0	0.0	6.8	0.0	0.0	0.1	8.7	9.0	0.8	21.3	21.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	82.2	0.0	0.0	80.6	0.0	0.0	10.5	10.1	10.0	7.2	33.9	33.9
LnGrp LOS	F	A	A	F	A	A	B	B	B	A	C	C
Approach Vol, veh/h		105			145			1144			1130	
Approach Delay, s/veh		82.2			80.6			10.0			31.9	
Approach LOS		F			F			B			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	11.9	139.8		28.3	8.8	142.9		28.3				
Change Period (Y+Rc), s	7.0	7.0		7.0	7.0	7.0		7.0				
Max Green Setting (Gmax), s	17.0	88.0		54.0	17.0	88.0		54.0				
Max Q Clear Time (g_c+I1), s	4.1	23.7		20.7	2.2	46.0		17.6				
Green Ext Time (p_c), s	0.1	7.9		0.5	0.0	2.6		1.0				

Intersection Summary												
HCM 6th Ctrl Delay			26.9									
HCM 6th LOS			C									

Intersection	
Intersection Delay, s/veh	8.5
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	8	78	17	7	114	32	22	63	3	17	54	14
Future Vol, veh/h	8	78	17	7	114	32	22	63	3	17	54	14
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	9	89	19	8	130	36	25	72	3	19	61	16
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	8.4	8.7	8.5	8.4
HCM LOS	A	A	A	A

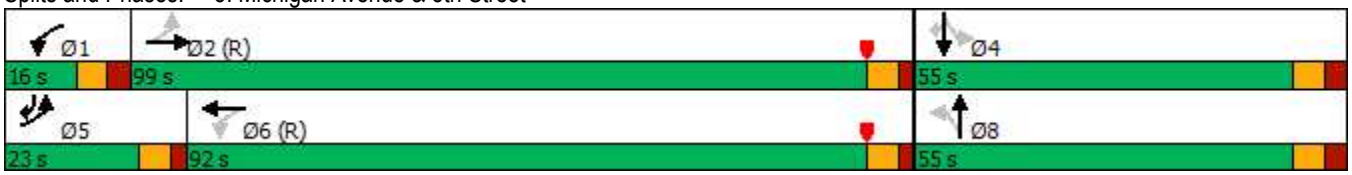
Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	25%	8%	5%	20%
Vol Thru, %	72%	76%	75%	64%
Vol Right, %	3%	17%	21%	16%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	88	103	153	85
LT Vol	22	8	7	17
Through Vol	63	78	114	54
RT Vol	3	17	32	14
Lane Flow Rate	100	117	174	97
Geometry Grp	1	1	1	1
Degree of Util (X)	0.132	0.148	0.215	0.126
Departure Headway (Hd)	4.763	4.538	4.443	4.681
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	752	790	808	765
Service Time	2.799	2.568	2.471	2.716
HCM Lane V/C Ratio	0.133	0.148	0.215	0.127
HCM Control Delay	8.5	8.4	8.7	8.4
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.5	0.5	0.8	0.4

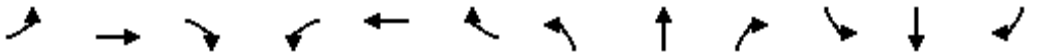
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	112	1293	10	1770	44	36	12	36	115
Future Volume (vph)	112	1293	10	1770	44	36	12	36	115
Lane Group Flow (vph)	118	1399	11	1906	0	100	0	51	121
Turn Type	pm+pt	NA	pm+pt	NA	Perm	NA	Perm	NA	pm+ov
Protected Phases	5	2	1	6		8		4	5
Permitted Phases	2		6		8		4		4
Detector Phase	5	2	1	6	8	8	4	4	5
Switch Phase									
Minimum Initial (s)	5.0	7.0	5.0	7.0	7.0	7.0	7.0	7.0	5.0
Minimum Split (s)	11.0	24.0	12.0	24.0	25.0	25.0	25.0	25.0	11.0
Total Split (s)	23.0	99.0	16.0	92.0	55.0	55.0	55.0	55.0	23.0
Total Split (%)	13.5%	58.2%	9.4%	54.1%	32.4%	32.4%	32.4%	32.4%	13.5%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	3.0	2.0	3.0	3.0	3.0	3.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0		0.0	0.0
Total Lost Time (s)	6.0	6.0	7.0	6.0		7.0		7.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag					Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes					Yes
Recall Mode	None	C-Max	None	C-Max	None	None	None	None	None
v/c Ratio	0.54	0.35	0.04	0.52		0.71		0.35	0.48
Control Delay	15.8	5.6	4.3	11.0		96.2		77.3	54.7
Queue Delay	0.0	0.0	0.0	0.0		0.0		0.0	0.0
Total Delay	15.8	5.6	4.3	11.0		96.2		77.3	54.7
Queue Length 50th (ft)	20	112	2	299		104		54	100
Queue Length 95th (ft)	68	229	7	443		167		99	153
Internal Link Dist (ft)		763		1859		253		306	
Turn Bay Length (ft)	140		155						58
Base Capacity (vph)	285	4014	331	3678		417		447	318
Starvation Cap Reductn	0	0	0	0		0		0	0
Spillback Cap Reductn	0	0	0	0		0		0	0
Storage Cap Reductn	0	0	0	0		0		0	0
Reduced v/c Ratio	0.41	0.35	0.03	0.52		0.24		0.11	0.38

Intersection Summary

Cycle Length: 170
Actuated Cycle Length: 170
Offset: 62 (36%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow
Natural Cycle: 70
Control Type: Actuated-Coordinated

Splits and Phases: 3: Michigan Avenue & 5th Street





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	112	1293	36	10	1770	41	44	36	15	12	36	115
Future Volume (veh/h)	112	1293	36	10	1770	41	44	36	15	12	36	115
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.94	1.00		0.94	0.97		0.94	0.98		0.92
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	118	1361	38	11	1863	43	46	38	16	13	38	121
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	239	3896	109	326	3860	89	80	60	21	55	141	191
Arrive On Green	0.03	0.77	0.77	0.01	0.76	0.76	0.10	0.10	0.10	0.10	0.10	0.10
Sat Flow, veh/h	1767	5056	141	1767	5085	117	489	596	207	282	1412	1448
Grp Volume(v), veh/h	118	909	490	11	1237	669	100	0	0	51	0	121
Grp Sat Flow(s),veh/h/ln	1767	1689	1820	1767	1689	1825	1292	0	0	1694	0	1448
Q Serve(g_s), s	2.6	14.4	14.4	0.2	23.7	23.7	8.9	0.0	0.0	0.0	0.0	13.5
Cycle Q Clear(g_c), s	2.6	14.4	14.4	0.2	23.7	23.7	13.3	0.0	0.0	4.3	0.0	13.5
Prop In Lane	1.00		0.08	1.00		0.06	0.46		0.16	0.25		1.00
Lane Grp Cap(c), veh/h	239	2602	1402	326	2564	1385	160	0	0	196	0	191
V/C Ratio(X)	0.49	0.35	0.35	0.03	0.48	0.48	0.63	0.00	0.00	0.26	0.00	0.63
Avail Cap(c_a), veh/h	364	2602	1402	398	2564	1385	420	0	0	502	0	455
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	7.4	6.1	6.1	5.0	7.8	7.8	75.2	0.0	0.0	70.8	0.0	70.3
Incr Delay (d2), s/veh	0.6	0.4	0.7	0.0	0.7	1.2	3.0	0.0	0.0	0.5	0.0	2.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.9	4.9	5.4	0.1	8.3	9.2	4.5	0.0	0.0	2.1	0.0	5.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	8.0	6.5	6.8	5.0	8.4	9.0	78.2	0.0	0.0	71.3	0.0	72.9
LnGrp LOS	A	A	A	A	A	A	E	A	A	E	A	E
Approach Vol, veh/h		1517			1917			100			172	
Approach Delay, s/veh		6.7			8.6			78.2			72.5	
Approach LOS		A			A			E			E	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	9.0	137.0		24.0	11.0	135.0		24.0				
Change Period (Y+Rc), s	7.0	6.0		7.0	6.0	6.0		7.0				
Max Green Setting (Gmax), s	9.0	93.0		48.0	17.0	86.0		48.0				
Max Q Clear Time (g_c+I1), s	2.2	16.4		15.5	4.6	25.7		15.3				
Green Ext Time (p_c), s	0.0	3.8		0.6	0.1	6.0		0.5				

Intersection Summary												
HCM 6th Ctrl Delay			12.7									
HCM 6th LOS			B									

FUTURE NO BUILD CONDITIONS

Table 2.1 - 2023 No Build Intersection Capacity Analysis Summary

Movement/Approach	Time	Level of Service[1]					
		Alton Road & 4th Street		Michigan Avenue & 4th Street		Michigan Avenue & 5th Street	
		LOS	Delay	LOS	Delay	LOS	Delay
EBL	AM	F	81.4			A	3.9
	PM	F	82.1			A	8.3
EBT	AM	A	0.0			C	26.8
	PM	A	0.0			A	6.6
EBR	AM	A	0.0			C	27.0
	PM	A	0.0			A	6.9
EB Approach	AM	F	81.4	A	7.5	C	26.1
	PM	F	82.1	A	8.4	A	6.8
WBL	AM	F	81.4			A	7.2
	PM	F	80.5			A	5.0
WBT	AM	A	0.0			A	5.6
	PM	A	0.0			A	8.5
WBR	AM	A	0.0			A	5.8
	PM	A	0.0			A	9.1
WB Approach	AM	F	81.4	A	7.5	A	5.7
	PM	F	80.5	A	8.7	A	8.7
NBL	AM	A	9.8			F	83.6
	PM	B	10.7			E	78.2
NBT	AM	A	6.2			A	0.0
	PM	B	10.2			A	0.0
NBR	AM	A	6.2			A	0.0
	PM	B	10.2			A	0.0
NB Approach	AM	A	6.2	A	7.7	F	83.6
	PM	B	10.2	A	8.5	E	78.2
SBL	AM	A	4.4			E	77.5
	PM	A	7.3			E	71.2
SBT	AM	C	32.2			A	0.0
	PM	C	34.3			A	0.0
SBR	AM	C	32.2			E	75.7
	PM	C	34.3			E	73.0
SB Approach	AM	C	30.7	A	7.6	E	76.4
	PM	C	32.3	A	8.4	E	72.5
Overall	AM	C	28.9			C	22.9
	PM	C	27.1			B	12.8

[1] Delay is average delay per vehicle in seconds

Table 2.2 - 2023 No Build Intersection Queue Lengths Summary

Location	Time	95th Percentile Queue Lenghts (ft)															
		EBL		EBR		WBL		WBR		NBL		NBR		SBL		SBR	
		Storage (ft)	95th %tile	Storage (ft)	95th %tile	Storage (ft)	95th %tile	Storage (ft)	95th %tile	Storage (ft)	95th %tile	Storage (ft)	95th %tile	Storage (ft)	95th %tile	Storage (ft)	95th %tile
Alton Road & 4th Street	AM									62	2			124	18		
	PM										8				37		
Michigan Avenue & 4th Street	AM																
	PM																
Michigan Avenue & 5th Street	AM	140	16			155	2									58	51
	PM		73				7										154

 # 95th percentile volume exceeds capacity, queue may be longer.

m Volume for 95th percentile queue is metered by upstream signal.

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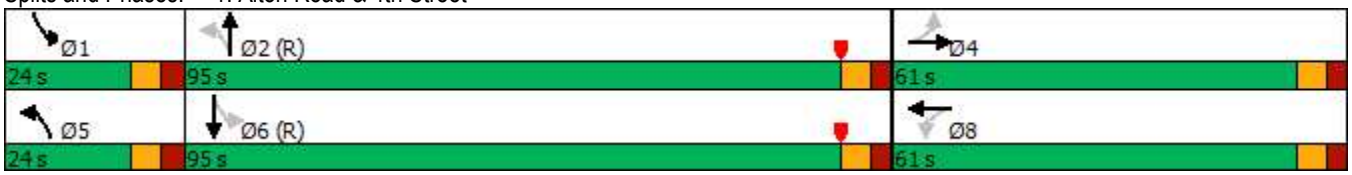
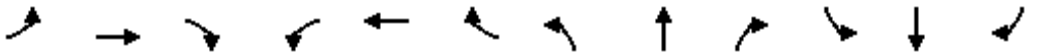
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	42	3	17	8	2	345	46	796
Future Volume (vph)	42	3	17	8	2	345	46	796
Lane Group Flow (vph)	0	67	0	99	3	476	61	1104
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	pm+pt	NA
Protected Phases		4		8	5	2	1	6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	5	2	1	6
Switch Phase								
Minimum Initial (s)	7.0	7.0	5.0	5.0	5.0	7.0	5.0	7.0
Minimum Split (s)	25.0	25.0	25.0	25.0	12.0	25.0	14.0	25.0
Total Split (s)	61.0	61.0	61.0	61.0	24.0	95.0	24.0	95.0
Total Split (%)	33.9%	33.9%	33.9%	33.9%	13.3%	52.8%	13.3%	52.8%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)		0.0		0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		7.0		7.0	7.0	7.0	7.0	7.0
Lead/Lag					Lead	Lag	Lead	Lag
Lead-Lag Optimize?					Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	C-Max	None	C-Max
v/c Ratio		0.83		0.56	0.01	0.18	0.09	0.39
Control Delay		135.1		47.1	3.5	6.3	3.1	5.1
Queue Delay		0.0		0.0	0.0	0.0	0.0	1.3
Total Delay		135.1		47.1	3.5	6.3	3.1	6.4
Queue Length 50th (ft)		73		47	1	78	11	153
Queue Length 95th (ft)		111		84	2	86	18	215
Internal Link Dist (ft)		161		515		1023		369
Turn Bay Length (ft)					62		124	
Base Capacity (vph)		286		492	507	2642	764	2853
Starvation Cap Reductn		0		0	0	0	0	1450
Spillback Cap Reductn		0		0	0	0	0	0
Storage Cap Reductn		0		0	0	0	0	0
Reduced v/c Ratio		0.23		0.20	0.01	0.18	0.08	0.79

Intersection Summary

Cycle Length: 180
Actuated Cycle Length: 180
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
Natural Cycle: 65
Control Type: Actuated-Coordinated

Splits and Phases: 1: Alton Road & 4th Street





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	42	3	6	17	8	50	2	345	17	46	796	43
Future Volume (veh/h)	42	3	6	17	8	50	2	345	17	46	796	43
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.95		0.92	0.95		0.91	1.00		0.96	1.00		0.96
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	55	4	8	22	11	66	3	454	22	61	1047	57
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	115	10	12	49	26	101	315	2603	126	744	2661	145
Arrive On Green	0.09	0.09	0.09	0.09	0.09	0.09	0.00	0.76	0.76	0.01	0.26	0.26
Sat Flow, veh/h	834	101	127	259	276	1069	1767	3415	165	1767	3391	185
Grp Volume(v), veh/h	67	0	0	99	0	0	3	234	242	61	544	560
Grp Sat Flow(s),veh/h/ln	1061	0	0	1604	0	0	1767	1763	1818	1767	1763	1812
Q Serve(g_s), s	1.8	0.0	0.0	0.0	0.0	0.0	0.1	6.5	6.6	1.4	45.9	45.9
Cycle Q Clear(g_c), s	12.1	0.0	0.0	10.3	0.0	0.0	0.1	6.5	6.6	1.4	45.9	45.9
Prop In Lane	0.82		0.12	0.22		0.67	1.00		0.09	1.00		0.10
Lane Grp Cap(c), veh/h	137	0	0	176	0	0	315	1343	1385	744	1383	1422
V/C Ratio(X)	0.49	0.00	0.00	0.56	0.00	0.00	0.01	0.17	0.17	0.08	0.39	0.39
Avail Cap(c_a), veh/h	402	0	0	471	0	0	475	1343	1385	864	1383	1422
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	79.4	0.0	0.0	78.6	0.0	0.0	9.8	5.9	5.9	4.4	31.3	31.4
Incr Delay (d2), s/veh	2.0	0.0	0.0	2.8	0.0	0.0	0.0	0.3	0.3	0.0	0.8	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.1	0.0	0.0	4.6	0.0	0.0	0.0	2.5	2.6	0.5	22.2	22.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	81.4	0.0	0.0	81.4	0.0	0.0	9.8	6.2	6.2	4.4	32.2	32.2
LnGrp LOS	F	A	A	F	A	A	A	A	A	A	C	C
Approach Vol, veh/h		67			99			479			1165	
Approach Delay, s/veh		81.4			81.4			6.2			30.7	
Approach LOS		F			F			A			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	11.8	144.2		24.1	7.7	148.2		24.1				
Change Period (Y+Rc), s	7.0	7.0		7.0	7.0	7.0		7.0				
Max Green Setting (Gmax), s	17.0	88.0		54.0	17.0	88.0		54.0				
Max Q Clear Time (g_c+I1), s	3.4	8.6		14.1	2.1	47.9		12.3				
Green Ext Time (p_c), s	0.1	2.5		0.3	0.0	2.7		0.7				

Intersection Summary												
HCM 6th Ctrl Delay			28.9									
HCM 6th LOS			C									

Intersection	
Intersection Delay, s/veh	7.6
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	14	26	15	3	39	23	12	40	3	9	36	3
Future Vol, veh/h	14	26	15	3	39	23	12	40	3	9	36	3
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	17	31	18	4	46	27	14	48	4	11	43	4
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	7.5	7.5	7.7	7.6
HCM LOS	A	A	A	A

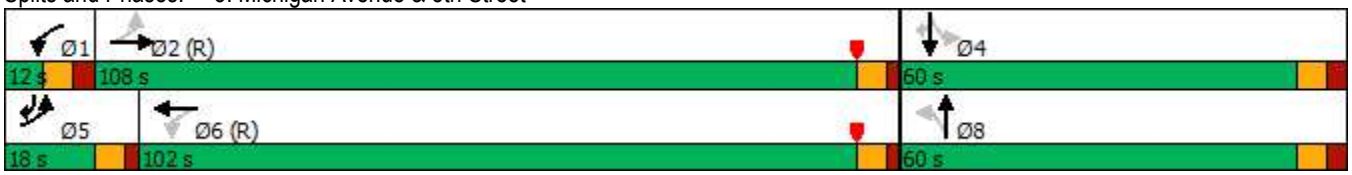
Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	22%	25%	5%	19%
Vol Thru, %	73%	47%	60%	75%
Vol Right, %	5%	27%	35%	6%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	55	55	65	48
LT Vol	12	14	3	9
Through Vol	40	26	39	36
RT Vol	3	15	23	3
Lane Flow Rate	65	65	77	57
Geometry Grp	1	1	1	1
Degree of Util (X)	0.077	0.075	0.086	0.067
Departure Headway (Hd)	4.254	4.111	4.01	4.249
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	832	859	881	832
Service Time	2.334	2.194	2.094	2.332
HCM Lane V/C Ratio	0.078	0.076	0.087	0.069
HCM Control Delay	7.7	7.5	7.5	7.6
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.2	0.2	0.3	0.2

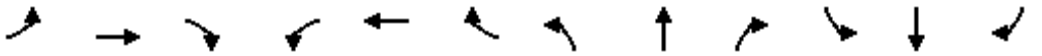
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	36	1101	2	868	34	37	20	29	71
Future Volume (vph)	36	1101	2	868	34	37	20	29	71
Lane Group Flow (vph)	40	1254	2	973	0	88	0	54	79
Turn Type	pm+pt	NA	pm+pt	NA	Perm	NA	Perm	NA	pm+ov
Protected Phases	5	2	1	6		8		4	5
Permitted Phases	2		6		8		4		4
Detector Phase	5	2	1	6	8	8	4	4	5
Switch Phase									
Minimum Initial (s)	5.0	7.0	5.0	7.0	7.0	7.0	7.0	7.0	5.0
Minimum Split (s)	11.0	24.0	12.0	24.0	25.0	25.0	25.0	25.0	11.0
Total Split (s)	18.0	108.0	12.0	102.0	60.0	60.0	60.0	60.0	18.0
Total Split (%)	10.0%	60.0%	6.7%	56.7%	33.3%	33.3%	33.3%	33.3%	10.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	3.0	2.0	3.0	3.0	3.0	3.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0		0.0	0.0
Total Lost Time (s)	6.0	6.0	7.0	6.0		7.0		7.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag					Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes					Yes
Recall Mode	None	C-Max	None	C-Max	None	None	None	None	None
v/c Ratio	0.09	0.30	0.01	0.25		0.69		0.46	0.32
Control Delay	3.2	4.2	3.5	5.8		103.3		89.4	14.6
Queue Delay	0.0	0.0	0.0	0.0		0.0		0.0	0.0
Total Delay	3.2	4.2	3.5	5.8		103.3		89.4	14.6
Queue Length 50th (ft)	6	93	0	101		100		62	0
Queue Length 95th (ft)	16	191	2	141		161		110	51
Internal Link Dist (ft)		763		1859		253		306	
Turn Bay Length (ft)	140		155						58
Base Capacity (vph)	500	4158	341	3924		442		419	304
Starvation Cap Reductn	0	0	0	0		0		0	0
Spillback Cap Reductn	0	0	0	0		0		0	0
Storage Cap Reductn	0	0	0	0		0		0	0
Reduced v/c Ratio	0.08	0.30	0.01	0.25		0.20		0.13	0.26

Intersection Summary

Cycle Length: 180
Actuated Cycle Length: 180
Offset: 128 (71%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow
Natural Cycle: 65
Control Type: Actuated-Coordinated

Splits and Phases: 3: Michigan Avenue & 5th Street





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	36	1101	28	2	868	8	34	37	8	20	29	71
Future Volume (veh/h)	36	1101	28	2	868	8	34	37	8	20	29	71
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.96	1.00		0.98	0.97		0.95	0.98		0.94
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	40	1223	31	2	964	9	38	41	9	22	32	79
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	499	4032	102	309	4029	38	68	65	12	72	94	174
Arrive On Green	0.01	0.26	0.26	0.00	0.78	0.78	0.09	0.09	0.09	0.09	0.09	0.09
Sat Flow, veh/h	1767	5074	129	1767	5174	48	425	710	129	480	1020	1484
Grp Volume(v), veh/h	40	814	440	2	629	344	88	0	0	54	0	79
Grp Sat Flow(s),veh/h/ln	1767	1689	1826	1767	1689	1846	1264	0	0	1500	0	1484
Q Serve(g_s), s	0.8	34.8	34.8	0.0	9.1	9.1	7.3	0.0	0.0	0.0	0.0	9.0
Cycle Q Clear(g_c), s	0.8	34.8	34.8	0.0	9.1	9.1	12.9	0.0	0.0	5.7	0.0	9.0
Prop In Lane	1.00		0.07	1.00		0.03	0.43		0.10	0.41		1.00
Lane Grp Cap(c), veh/h	499	2683	1451	309	2630	1437	145	0	0	166	0	174
V/C Ratio(X)	0.08	0.30	0.30	0.01	0.24	0.24	0.61	0.00	0.00	0.33	0.00	0.45
Avail Cap(c_a), veh/h	574	2683	1451	353	2630	1437	448	0	0	488	0	475
HCM Platoon Ratio	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	3.9	26.5	26.5	7.2	5.4	5.4	80.6	0.0	0.0	76.6	0.0	74.3
Incr Delay (d2), s/veh	0.0	0.3	0.5	0.0	0.2	0.4	3.1	0.0	0.0	0.8	0.0	1.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	16.0	17.4	0.0	3.2	3.5	4.2	0.0	0.0	2.4	0.0	3.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	3.9	26.8	27.0	7.2	5.6	5.8	83.6	0.0	0.0	77.5	0.0	75.7
LnGrp LOS	A	C	C	A	A	A	F	A	A	E	A	E
Approach Vol, veh/h		1294			975			88			133	
Approach Delay, s/veh		26.1			5.7			83.6			76.4	
Approach LOS		C			A			F			E	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	7.5	149.0		23.5	10.3	146.2		23.5				
Change Period (Y+Rc), s	7.0	6.0		7.0	6.0	6.0		7.0				
Max Green Setting (Gmax), s	5.0	102.0		53.0	12.0	96.0		53.0				
Max Q Clear Time (g_c+I1), s	2.0	36.8		11.0	2.8	11.1		14.9				
Green Ext Time (p_c), s	0.0	3.2		0.5	0.0	2.3		0.4				

Intersection Summary												
HCM 6th Ctrl Delay			22.9									
HCM 6th LOS			C									

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	63	21	34	9	9	1010	75	888
Future Volume (vph)	63	21	34	9	9	1010	75	888
Lane Group Flow (vph)	0	106	0	147	10	1146	83	1057
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	pm+pt	NA
Protected Phases		4		8	5	2	1	6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	5	2	1	6
Switch Phase								
Minimum Initial (s)	7.0	7.0	5.0	5.0	5.0	7.0	5.0	7.0
Minimum Split (s)	25.0	25.0	25.0	25.0	12.0	25.0	14.0	25.0
Total Split (s)	61.0	61.0	61.0	61.0	24.0	95.0	24.0	95.0
Total Split (%)	33.9%	33.9%	33.9%	33.9%	13.3%	52.8%	13.3%	52.8%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)		0.0		0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		7.0		7.0	7.0	7.0	7.0	7.0
Lead/Lag					Lead	Lag	Lead	Lag
Lead-Lag Optimize?					Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	C-Max	None	C-Max
v/c Ratio		1.00		0.69	0.03	0.45	0.23	0.39
Control Delay		161.4		61.1	4.7	11.1	5.6	7.9
Queue Delay		0.0		0.0	0.0	0.0	0.0	1.9
Total Delay		161.4		61.1	4.7	11.1	5.6	9.8
Queue Length 50th (ft)		~125		102	2	262	17	154
Queue Length 95th (ft)		#214		178	8	378	37	319
Internal Link Dist (ft)		161		515		1023		369
Turn Bay Length (ft)					62		124	
Base Capacity (vph)		277		471	501	2542	438	2699
Starvation Cap Reductn		0		0	0	0	0	1427
Spillback Cap Reductn		0		0	0	0	0	0
Storage Cap Reductn		0		0	0	0	0	0
Reduced v/c Ratio		0.38		0.31	0.02	0.45	0.19	0.83

Intersection Summary

Cycle Length: 180
Actuated Cycle Length: 180
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
Natural Cycle: 70
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Alton Road & 4th Street

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	63	21	12	34	9	89	9	1010	22	75	888	63
Future Volume (veh/h)	63	21	12	34	9	89	9	1010	22	75	888	63
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.92	1.00		0.92	1.00		0.96	1.00		0.96
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	70	23	13	38	10	99	10	1122	24	83	987	70
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	108	34	15	66	22	129	327	2596	56	387	2505	178
Arrive On Green	0.12	0.12	0.12	0.12	0.12	0.12	0.01	0.74	0.74	0.01	0.25	0.25
Sat Flow, veh/h	628	282	127	341	183	1081	1767	3525	75	1767	3327	236
Grp Volume(v), veh/h	106	0	0	147	0	0	10	561	585	83	523	534
Grp Sat Flow(s),veh/h/ln	1037	0	0	1605	0	0	1767	1763	1838	1767	1763	1801
Q Serve(g_s), s	3.2	0.0	0.0	0.0	0.0	0.0	0.3	22.1	22.1	2.1	44.5	44.5
Cycle Q Clear(g_c), s	19.0	0.0	0.0	15.8	0.0	0.0	0.3	22.1	22.1	2.1	44.5	44.5
Prop In Lane	0.66		0.12	0.26		0.67	1.00		0.04	1.00		0.13
Lane Grp Cap(c), veh/h	157	0	0	217	0	0	327	1298	1354	387	1327	1356
V/C Ratio(X)	0.67	0.00	0.00	0.68	0.00	0.00	0.03	0.43	0.43	0.21	0.39	0.39
Avail Cap(c_a), veh/h	405	0	0	478	0	0	475	1298	1354	506	1327	1356
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	78.4	0.0	0.0	76.8	0.0	0.0	10.7	9.2	9.2	7.0	33.4	33.4
Incr Delay (d2), s/veh	3.7	0.0	0.0	3.7	0.0	0.0	0.0	1.1	1.0	0.3	0.9	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.1	0.0	0.0	6.9	0.0	0.0	0.1	8.9	9.2	0.8	21.6	22.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	82.1	0.0	0.0	80.5	0.0	0.0	10.7	10.2	10.2	7.3	34.3	34.3
LnGrp LOS	F	A	A	F	A	A	B	B	B	A	C	C
Approach Vol, veh/h		106			147			1156			1140	
Approach Delay, s/veh		82.1			80.5			10.2			32.3	
Approach LOS		F			F			B			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	11.9	139.6		28.5	9.0	142.5		28.5				
Change Period (Y+Rc), s	7.0	7.0		7.0	7.0	7.0		7.0				
Max Green Setting (Gmax), s	17.0	88.0		54.0	17.0	88.0		54.0				
Max Q Clear Time (g_c+I1), s	4.1	24.1		21.0	2.3	46.5		17.8				
Green Ext Time (p_c), s	0.1	8.0		0.5	0.0	2.6		1.0				

Intersection Summary			
HCM 6th Ctrl Delay		27.1	
HCM 6th LOS		C	

Intersection	
Intersection Delay, s/veh	8.5
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	9	79	17	7	115	33	22	63	3	17	55	14
Future Vol, veh/h	9	79	17	7	115	33	22	63	3	17	55	14
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	10	90	19	8	131	38	25	72	3	19	63	16
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	8.4	8.7	8.5	8.4
HCM LOS	A	A	A	A

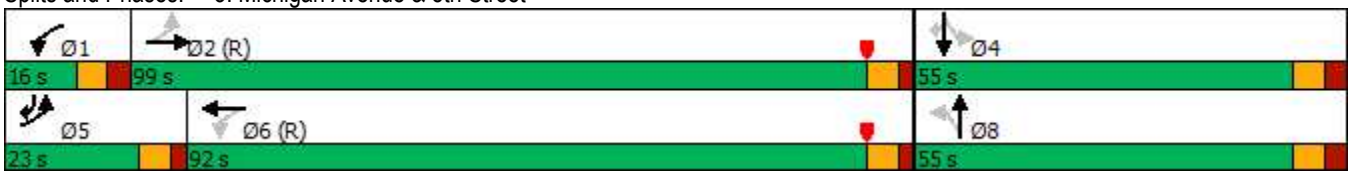
Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	25%	9%	5%	20%
Vol Thru, %	72%	75%	74%	64%
Vol Right, %	3%	16%	21%	16%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	88	105	155	86
LT Vol	22	9	7	17
Through Vol	63	79	115	55
RT Vol	3	17	33	14
Lane Flow Rate	100	119	176	98
Geometry Grp	1	1	1	1
Degree of Util (X)	0.133	0.151	0.218	0.127
Departure Headway (Hd)	4.776	4.548	4.447	4.693
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	750	789	807	762
Service Time	2.812	2.578	2.475	2.73
HCM Lane V/C Ratio	0.133	0.151	0.218	0.129
HCM Control Delay	8.5	8.4	8.7	8.4
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.5	0.5	0.8	0.4

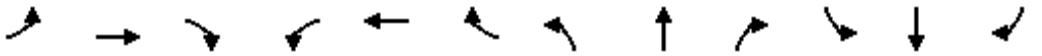
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	113	1306	10	1788	45	36	12	36	117
Future Volume (vph)	113	1306	10	1788	45	36	12	36	117
Lane Group Flow (vph)	119	1413	11	1925	0	101	0	51	123
Turn Type	pm+pt	NA	pm+pt	NA	Perm	NA	Perm	NA	pm+ov
Protected Phases	5	2	1	6		8		4	5
Permitted Phases	2		6		8		4		4
Detector Phase	5	2	1	6	8	8	4	4	5
Switch Phase									
Minimum Initial (s)	5.0	7.0	5.0	7.0	7.0	7.0	7.0	7.0	5.0
Minimum Split (s)	11.0	24.0	12.0	24.0	25.0	25.0	25.0	25.0	11.0
Total Split (s)	23.0	99.0	16.0	92.0	55.0	55.0	55.0	55.0	23.0
Total Split (%)	13.5%	58.2%	9.4%	54.1%	32.4%	32.4%	32.4%	32.4%	13.5%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	3.0	2.0	3.0	3.0	3.0	3.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0		0.0	0.0
Total Lost Time (s)	6.0	6.0	7.0	6.0		7.0		7.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag					Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes					Yes
Recall Mode	None	C-Max	None	C-Max	None	None	None	None	None
v/c Ratio	0.54	0.35	0.04	0.52		0.72		0.35	0.48
Control Delay	16.5	5.7	4.4	11.2		96.4		77.0	54.6
Queue Delay	0.0	0.0	0.0	0.0		0.0		0.0	0.0
Total Delay	16.5	5.7	4.4	11.2		96.4		77.0	54.6
Queue Length 50th (ft)	20	114	2	307		105		54	102
Queue Length 95th (ft)	73	232	7	453		168		99	154
Internal Link Dist (ft)		763		1859		253		306	
Turn Bay Length (ft)	140		155						58
Base Capacity (vph)	283	4010	328	3669		417		448	319
Starvation Cap Reductn	0	0	0	0		0		0	0
Spillback Cap Reductn	0	0	0	0		0		0	0
Storage Cap Reductn	0	0	0	0		0		0	0
Reduced v/c Ratio	0.42	0.35	0.03	0.52		0.24		0.11	0.39

Intersection Summary

Cycle Length: 170
Actuated Cycle Length: 170
Offset: 62 (36%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow
Natural Cycle: 70
Control Type: Actuated-Coordinated

Splits and Phases: 3: Michigan Avenue & 5th Street





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	113	1306	36	10	1788	41	45	36	15	12	36	117
Future Volume (veh/h)	113	1306	36	10	1788	41	45	36	15	12	36	117
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.94	1.00		0.94	0.97		0.94	0.98		0.92
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	119	1375	38	11	1882	43	47	38	16	13	38	123
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	236	3893	108	321	3857	88	81	59	20	55	142	192
Arrive On Green	0.03	0.77	0.77	0.01	0.76	0.76	0.10	0.10	0.10	0.10	0.10	0.10
Sat Flow, veh/h	1767	5057	140	1767	5086	116	494	587	204	283	1409	1448
Grp Volume(v), veh/h	119	918	495	11	1249	676	101	0	0	51	0	123
Grp Sat Flow(s),veh/h/ln	1767	1689	1820	1767	1689	1825	1285	0	0	1691	0	1448
Q Serve(g_s), s	2.6	14.6	14.6	0.2	24.1	24.2	9.1	0.0	0.0	0.0	0.0	13.7
Cycle Q Clear(g_c), s	2.6	14.6	14.6	0.2	24.1	24.2	13.5	0.0	0.0	4.3	0.0	13.7
Prop In Lane	1.00		0.08	1.00		0.06	0.47		0.16	0.25		1.00
Lane Grp Cap(c), veh/h	236	2600	1401	321	2561	1384	160	0	0	197	0	192
V/C Ratio(X)	0.50	0.35	0.35	0.03	0.49	0.49	0.63	0.00	0.00	0.26	0.00	0.64
Avail Cap(c_a), veh/h	361	2600	1401	394	2561	1384	419	0	0	502	0	455
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	7.7	6.2	6.2	5.0	7.9	7.9	75.2	0.0	0.0	70.7	0.0	70.3
Incr Delay (d2), s/veh	0.6	0.4	0.7	0.0	0.7	1.2	3.0	0.0	0.0	0.5	0.0	2.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.9	5.0	5.6	0.1	8.5	9.4	4.5	0.0	0.0	2.1	0.0	5.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	8.3	6.6	6.9	5.0	8.5	9.1	78.2	0.0	0.0	71.2	0.0	73.0
LnGrp LOS	A	A	A	A	A	A	E	A	A	E	A	E
Approach Vol, veh/h		1532			1936			101			174	
Approach Delay, s/veh		6.8			8.7			78.2			72.5	
Approach LOS		A			A			E			E	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	9.0	136.9		24.1	11.0	134.9		24.1				
Change Period (Y+Rc), s	7.0	6.0		7.0	6.0	6.0		7.0				
Max Green Setting (Gmax), s	9.0	93.0		48.0	17.0	86.0		48.0				
Max Q Clear Time (g_c+I1), s	2.2	16.6		15.7	4.6	26.2		15.5				
Green Ext Time (p_c), s	0.0	3.8		0.6	0.1	6.1		0.5				

Intersection Summary												
HCM 6th Ctrl Delay			12.8									
HCM 6th LOS			B									

FUTURE BUILD CONDITIONS

Table 5.1 - 2023 Build Intersection Capacity Analysis Summary

Movement/Approach	Time	Level of Service[1]					
		Alton Road & 4th Street		Michigan Avenue & 4th Street		Michigan Avenue & 5th Street	
		LOS	Delay	LOS	Delay	LOS	Delay
EBL	AM	F	81.4			A	4.2
	PM	F	81.5			A	8.9
EBT	AM	A	0.0			C	27.8
	PM	A	0.0			A	6.6
EBR	AM	A	0.0			C	28.0
	PM	A	0.0			A	7.0
EB Approach	AM	F	81.4	A	7.7	C	27.1
	PM	F	81.5	A	8.6	A	6.9
WBL	AM	F	81.5			A	7.6
	PM	F	80.5			A	5.0
WBT	AM	A	0.0			A	5.9
	PM	A	0.0			A	8.7
WBR	AM	A	0.0			A	6.1
	PM	A	0.0			A	9.3
WB Approach	AM	F	81.5	A	7.5	A	6.0
	PM	F	80.5	A	9.4	A	8.9
NBL	AM	A	9.8			F	84.3
	PM	B	11.0			E	75.9
NBT	AM	A	6.2			A	0.0
	PM	B	10.7			A	0.0
NBR	AM	A	6.2			A	0.0
	PM	B	10.6			A	0.0
NB Approach	AM	A	6.2	A	7.8	F	84.3
	PM	B	10.7	A	8.8	E	75.9
SBL	AM	A	4.5			E	77.6
	PM	A	7.8			E	71.6
SBT	AM	C	32.2			A	0.0
	PM	C	34.9			A	0.0
SBR	AM	C	32.2			E	74.5
	PM	C	34.8			E	72.9
SB Approach	AM	C	30.5	A	7.7	E	76.0
	PM	C	32.8	A	8.7	E	72.5
Overall	AM	C	28.8			C	23.9
	PM	C	27.8			B	12.6

[1] Delay is average delay per vehicle in seconds

Table 5.2 - 2023 Build Intersection Queue Lengths Summary

Location	Time	95th Percentile Queue Lenghts (ft)															
		EBL		EBR		WBL		WBR		NBL		NBR		SBL		SBR	
		Storage (ft)	95th %tile	Storage (ft)	95th %tile	Storage (ft)	95th %tile	Storage (ft)	95th %tile	Storage (ft)	95th %tile	Storage (ft)	95th %tile	Storage (ft)	95th %tile	Storage (ft)	95th %tile
Alton Road & 4th Street	AM									62	2			124	21		
	PM										8				40		
Michigan Avenue & 4th Street	AM																
	PM																
Michigan Avenue & 5th Street	AM	140	16			155	4									58	51
	PM		77				7										158

 # 95th percentile volume exceeds capacity, queue may be longer.

m Volume for 95th percentile queue is metered by upstream signal.

[1] Optimized signal timing without changing cycle length

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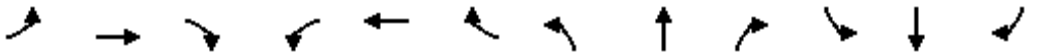
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	42	3	17	8	2	345	56	796
Future Volume (vph)	42	3	17	8	2	345	56	796
Lane Group Flow (vph)	0	67	0	101	3	478	74	1104
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	pm+pt	NA
Protected Phases		4		8	5	2	1	6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	5	2	1	6
Switch Phase								
Minimum Initial (s)	7.0	7.0	5.0	5.0	5.0	7.0	5.0	7.0
Minimum Split (s)	25.0	25.0	25.0	25.0	12.0	25.0	14.0	25.0
Total Split (s)	61.0	61.0	61.0	61.0	24.0	95.0	24.0	95.0
Total Split (%)	33.9%	33.9%	33.9%	33.9%	13.3%	52.8%	13.3%	52.8%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)		0.0		0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		7.0		7.0	7.0	7.0	7.0	7.0
Lead/Lag					Lead	Lag	Lead	Lag
Lead-Lag Optimize?					Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	C-Max	None	C-Max
v/c Ratio		0.85		0.57	0.01	0.18	0.10	0.39
Control Delay		139.1		46.7	3.5	6.4	3.2	5.1
Queue Delay		0.0		0.0	0.0	0.0	0.0	1.3
Total Delay		139.1		46.7	3.5	6.4	3.2	6.4
Queue Length 50th (ft)		73		47	1	80	14	153
Queue Length 95th (ft)		111		84	2	87	21	215
Internal Link Dist (ft)		161		515		1023		369
Turn Bay Length (ft)					62		124	
Base Capacity (vph)		280		494	507	2633	763	2853
Starvation Cap Reductn		0		0	0	0	0	1450
Spillback Cap Reductn		0		0	0	0	0	0
Storage Cap Reductn		0		0	0	0	0	0
Reduced v/c Ratio		0.24		0.20	0.01	0.18	0.10	0.79

Intersection Summary

Cycle Length: 180
Actuated Cycle Length: 180
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
Natural Cycle: 65
Control Type: Actuated-Coordinated

Splits and Phases: 1: Alton Road & 4th Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	42	3	6	17	8	52	2	345	18	56	796	43
Future Volume (veh/h)	42	3	6	17	8	52	2	345	18	56	796	43
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.95		0.92	0.95		0.91	1.00		0.96	1.00		0.96
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	55	4	8	22	11	68	3	454	24	74	1047	57
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	115	10	12	49	26	103	315	2587	136	743	2660	145
Arrive On Green	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.76	0.76	0.01	0.26	0.26
Sat Flow, veh/h	823	100	125	255	270	1082	1767	3398	179	1767	3391	185
Grp Volume(v), veh/h	67	0	0	101	0	0	3	235	243	74	544	560
Grp Sat Flow(s),veh/h/ln	1048	0	0	1607	0	0	1767	1763	1814	1767	1763	1812
Q Serve(g_s), s	1.8	0.0	0.0	0.0	0.0	0.0	0.1	6.6	6.7	1.6	45.9	45.9
Cycle Q Clear(g_c), s	12.3	0.0	0.0	10.6	0.0	0.0	0.1	6.6	6.7	1.6	45.9	45.9
Prop In Lane	0.82		0.12	0.22		0.67	1.00		0.10	1.00		0.10
Lane Grp Cap(c), veh/h	136	0	0	177	0	0	315	1342	1381	743	1383	1422
V/C Ratio(X)	0.49	0.00	0.00	0.57	0.00	0.00	0.01	0.18	0.18	0.10	0.39	0.39
Avail Cap(c_a), veh/h	400	0	0	471	0	0	475	1342	1381	862	1383	1422
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	79.4	0.0	0.0	78.6	0.0	0.0	9.8	5.9	5.9	4.4	31.4	31.4
Incr Delay (d2), s/veh	2.0	0.0	0.0	2.9	0.0	0.0	0.0	0.3	0.3	0.1	0.8	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.1	0.0	0.0	4.7	0.0	0.0	0.0	2.6	2.6	0.6	22.2	22.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	81.4	0.0	0.0	81.5	0.0	0.0	9.8	6.2	6.2	4.5	32.2	32.2
LnGrp LOS	F	A	A	F	A	A	A	A	A	A	C	C
Approach Vol, veh/h		67			101			481			1178	
Approach Delay, s/veh		81.4			81.5			6.2			30.5	
Approach LOS		F			F			A			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	11.9	144.0		24.1	7.7	148.2		24.1				
Change Period (Y+Rc), s	7.0	7.0		7.0	7.0	7.0		7.0				
Max Green Setting (Gmax), s	17.0	88.0		54.0	17.0	88.0		54.0				
Max Q Clear Time (g_c+I1), s	3.6	8.7		14.3	2.1	47.9		12.6				
Green Ext Time (p_c), s	0.1	2.5		0.3	0.0	2.7		0.7				

Intersection Summary												
HCM 6th Ctrl Delay			28.8									
HCM 6th LOS			C									

Intersection	
Intersection Delay, s/veh	7.7
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	25	26	15	3	41	36	12	42	3	9	36	3
Future Vol, veh/h	25	26	15	3	41	36	12	42	3	9	36	3
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	30	31	18	4	49	43	14	50	4	11	43	4
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	7.7	7.5	7.8	7.7
HCM LOS	A	A	A	A

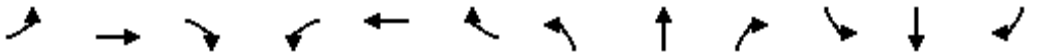
Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	21%	38%	4%	19%
Vol Thru, %	74%	39%	51%	75%
Vol Right, %	5%	23%	45%	6%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	57	66	80	48
LT Vol	12	25	3	9
Through Vol	42	26	41	36
RT Vol	3	15	36	3
Lane Flow Rate	68	79	95	57
Geometry Grp	1	1	1	1
Degree of Util (X)	0.081	0.091	0.105	0.068
Departure Headway (Hd)	4.308	4.181	3.965	4.305
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	819	844	889	818
Service Time	2.402	2.273	2.058	2.404
HCM Lane V/C Ratio	0.083	0.094	0.107	0.07
HCM Control Delay	7.8	7.7	7.5	7.7
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.3	0.3	0.4	0.2

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	36	1101	4	872	34	37	20	48	71
Future Volume (vph)	36	1101	4	872	34	37	20	48	71
Lane Group Flow (vph)	40	1275	4	982	0	88	0	75	79
Turn Type	pm+pt	NA	pm+pt	NA	Perm	NA	Perm	NA	pm+ov
Protected Phases	5	2	1	6		8		4	5
Permitted Phases	2		6		8		4		4
Detector Phase	5	2	1	6	8	8	4	4	5
Switch Phase									
Minimum Initial (s)	5.0	7.0	5.0	7.0	7.0	7.0	7.0	7.0	5.0
Minimum Split (s)	11.0	24.0	12.0	24.0	25.0	25.0	25.0	25.0	11.0
Total Split (s)	18.0	108.0	12.0	102.0	60.0	60.0	60.0	60.0	18.0
Total Split (%)	10.0%	60.0%	6.7%	56.7%	33.3%	33.3%	33.3%	33.3%	10.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	3.0	2.0	3.0	3.0	3.0	3.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0		0.0	0.0
Total Lost Time (s)	6.0	6.0	7.0	6.0		7.0		7.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag					Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes					Yes
Recall Mode	None	C-Max	None	C-Max	None	None	None	None	None
v/c Ratio	0.09	0.31	0.01	0.25		0.70		0.59	0.32
Control Delay	3.2	4.2	3.2	5.8		105.0		97.0	14.6
Queue Delay	0.0	0.0	0.0	0.0		0.0		0.0	0.0
Total Delay	3.2	4.2	3.2	5.8		105.0		97.0	14.6
Queue Length 50th (ft)	6	95	1	102		100		87	0
Queue Length 95th (ft)	16	196	4	143		162		144	51
Internal Link Dist (ft)		763		1859		253		306	
Turn Bay Length (ft)	140		155						58
Base Capacity (vph)	498	4142	333	3915		432		447	304
Starvation Cap Reductn	0	0	0	0		0		0	0
Spillback Cap Reductn	0	0	0	0		0		0	0
Storage Cap Reductn	0	0	0	0		0		0	0
Reduced v/c Ratio	0.08	0.31	0.01	0.25		0.20		0.17	0.26

Intersection Summary

Cycle Length: 180
Actuated Cycle Length: 180
Offset: 128 (71%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow
Natural Cycle: 65
Control Type: Actuated-Coordinated

Splits and Phases: 3: Michigan Avenue & 5th Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	36	1101	47	4	872	12	34	37	8	20	48	71
Future Volume (veh/h)	36	1101	47	4	872	12	34	37	8	20	48	71
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.96	1.00		0.98	0.98		0.95	0.98		0.95
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	40	1223	52	4	969	13	38	41	9	22	53	79
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	491	3910	166	302	3980	53	65	62	11	58	124	183
Arrive On Green	0.01	0.26	0.26	0.01	0.77	0.77	0.10	0.10	0.10	0.10	0.10	0.10
Sat Flow, veh/h	1767	4972	211	1767	5149	69	369	640	115	328	1275	1488
Grp Volume(v), veh/h	40	831	444	4	635	347	88	0	0	75	0	79
Grp Sat Flow(s),veh/h/ln	1767	1689	1807	1767	1689	1841	1124	0	0	1603	0	1488
Q Serve(g_s), s	0.8	35.7	35.7	0.1	9.5	9.5	7.3	0.0	0.0	0.0	0.0	8.9
Cycle Q Clear(g_c), s	0.8	35.7	35.7	0.1	9.5	9.5	14.8	0.0	0.0	7.5	0.0	8.9
Prop In Lane	1.00		0.12	1.00		0.04	0.43		0.10	0.29		1.00
Lane Grp Cap(c), veh/h	491	2656	1421	302	2610	1423	138	0	0	182	0	183
V/C Ratio(X)	0.08	0.31	0.31	0.01	0.24	0.24	0.64	0.00	0.00	0.41	0.00	0.43
Avail Cap(c_a), veh/h	566	2656	1421	342	2610	1423	431	0	0	509	0	476
HCM Platoon Ratio	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	4.1	27.4	27.5	7.6	5.7	5.7	80.7	0.0	0.0	76.5	0.0	73.4
Incr Delay (d2), s/veh	0.0	0.3	0.6	0.0	0.2	0.4	3.6	0.0	0.0	1.1	0.0	1.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	16.4	17.7	0.0	3.3	3.7	4.2	0.0	0.0	3.4	0.0	3.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	4.2	27.8	28.0	7.6	5.9	6.1	84.3	0.0	0.0	77.6	0.0	74.5
LnGrp LOS	A	C	C	A	A	A	F	A	A	E	A	E
Approach Vol, veh/h		1315			986			88			154	
Approach Delay, s/veh		27.1			6.0			84.3			76.0	
Approach LOS		C			A			F			E	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	7.9	147.5		24.5	10.3	145.1		24.5				
Change Period (Y+Rc), s	7.0	6.0		7.0	6.0	6.0		7.0				
Max Green Setting (Gmax), s	5.0	102.0		53.0	12.0	96.0		53.0				
Max Q Clear Time (g_c+I1), s	2.1	37.7		10.9	2.8	11.5		16.8				
Green Ext Time (p_c), s	0.0	3.3		0.6	0.0	2.4		0.4				

Intersection Summary												
HCM 6th Ctrl Delay			23.9									
HCM 6th LOS			C									

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	63	21	35	9	9	1010	80	888
Future Volume (vph)	63	21	35	9	9	1010	80	888
Lane Group Flow (vph)	0	106	0	161	10	1148	89	1057
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	pm+pt	NA
Protected Phases		4		8	5	2	1	6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	5	2	1	6
Switch Phase								
Minimum Initial (s)	7.0	7.0	5.0	5.0	5.0	7.0	5.0	7.0
Minimum Split (s)	25.0	25.0	25.0	25.0	12.0	25.0	14.0	25.0
Total Split (s)	61.0	61.0	61.0	61.0	24.0	95.0	24.0	95.0
Total Split (%)	33.9%	33.9%	33.9%	33.9%	13.3%	52.8%	13.3%	52.8%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lost Time Adjust (s)		0.0		0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		7.0		7.0	7.0	7.0	7.0	7.0
Lead/Lag					Lead	Lag	Lead	Lag
Lead-Lag Optimize?					Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	C-Max	None	C-Max
v/c Ratio		1.06		0.73	0.03	0.45	0.25	0.39
Control Delay		176.2		62.8	4.9	11.4	5.9	8.0
Queue Delay		0.0		0.0	0.0	0.0	0.0	1.9
Total Delay		176.2		62.8	4.9	11.4	5.9	9.9
Queue Length 50th (ft)		~134		112	2	266	18	156
Queue Length 95th (ft)		#224		193	8	385	40	323
Internal Link Dist (ft)		161		515		1023		369
Turn Bay Length (ft)					62		124	
Base Capacity (vph)		256		477	500	2531	436	2692
Starvation Cap Reductn		0		0	0	0	0	1420
Spillback Cap Reductn		0		0	0	0	0	0
Storage Cap Reductn		0		0	0	0	0	0
Reduced v/c Ratio		0.41		0.34	0.02	0.45	0.20	0.83

Intersection Summary

Cycle Length: 180
Actuated Cycle Length: 180
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
Natural Cycle: 70
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Alton Road & 4th Street

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	63	21	12	35	9	101	9	1010	23	80	888	63
Future Volume (veh/h)	63	21	12	35	9	101	9	1010	23	80	888	63
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.92	1.00		0.92	1.00		0.96	1.00		0.96
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	70	23	13	39	10	112	10	1122	26	89	987	70
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	108	34	15	65	21	141	324	2569	60	382	2485	176
Arrive On Green	0.13	0.13	0.13	0.13	0.13	0.13	0.01	0.73	0.73	0.01	0.25	0.25
Sat Flow, veh/h	598	268	121	322	169	1122	1767	3518	82	1767	3327	236
Grp Volume(v), veh/h	106	0	0	161	0	0	10	562	586	89	523	534
Grp Sat Flow(s),veh/h/ln	987	0	0	1613	0	0	1767	1763	1836	1767	1763	1800
Q Serve(g_s), s	2.8	0.0	0.0	0.0	0.0	0.0	0.3	22.7	22.7	2.3	44.6	44.6
Cycle Q Clear(g_c), s	20.0	0.0	0.0	17.2	0.0	0.0	0.3	22.7	22.7	2.3	44.6	44.6
Prop In Lane	0.66		0.12	0.24		0.70	1.00		0.04	1.00		0.13
Lane Grp Cap(c), veh/h	157	0	0	227	0	0	324	1288	1341	382	1317	1345
V/C Ratio(X)	0.67	0.00	0.00	0.71	0.00	0.00	0.03	0.44	0.44	0.23	0.40	0.40
Avail Cap(c_a), veh/h	397	0	0	480	0	0	471	1288	1341	500	1317	1345
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	77.8	0.0	0.0	76.5	0.0	0.0	11.0	9.6	9.6	7.5	34.0	34.0
Incr Delay (d2), s/veh	3.7	0.0	0.0	4.0	0.0	0.0	0.0	1.1	1.0	0.3	0.9	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.1	0.0	0.0	7.6	0.0	0.0	0.1	9.1	9.5	0.9	21.6	22.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	81.5	0.0	0.0	80.5	0.0	0.0	11.0	10.7	10.6	7.8	34.9	34.8
LnGrp LOS	F	A	A	F	A	A	B	B	B	A	C	C
Approach Vol, veh/h		106			161			1158			1146	
Approach Delay, s/veh		81.5			80.5			10.7			32.8	
Approach LOS		F			F			B			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	11.9	138.5		29.6	9.0	141.4		29.6				
Change Period (Y+Rc), s	7.0	7.0		7.0	7.0	7.0		7.0				
Max Green Setting (Gmax), s	17.0	88.0		54.0	17.0	88.0		54.0				
Max Q Clear Time (g_c+I1), s	4.3	24.7		22.0	2.3	46.6		19.2				
Green Ext Time (p_c), s	0.1	8.0		0.5	0.0	2.6		1.1				

Intersection Summary			
HCM 6th Ctrl Delay		27.8	
HCM 6th LOS		C	

Intersection	
Intersection Delay, s/veh	9
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	14	79	17	9	128	94	22	64	3	17	55	14
Future Vol, veh/h	14	79	17	9	128	94	22	64	3	17	55	14
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	16	90	19	10	145	107	25	73	3	19	63	16
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	8.6	9.4	8.8	8.7
HCM LOS	A	A	A	A

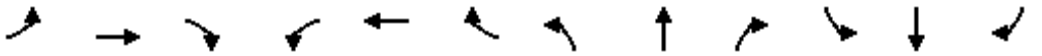
Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	25%	13%	4%	20%
Vol Thru, %	72%	72%	55%	64%
Vol Right, %	3%	15%	41%	16%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	89	110	231	86
LT Vol	22	14	9	17
Through Vol	64	79	128	55
RT Vol	3	17	94	14
Lane Flow Rate	101	125	262	98
Geometry Grp	1	1	1	1
Degree of Util (X)	0.14	0.162	0.318	0.133
Departure Headway (Hd)	4.98	4.671	4.358	4.9
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	717	765	824	729
Service Time	3.031	2.714	2.393	2.951
HCM Lane V/C Ratio	0.141	0.163	0.318	0.134
HCM Control Delay	8.8	8.6	9.4	8.7
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.5	0.6	1.4	0.5

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (vph)	113	1306	11	1811	34	37	12	45	117
Future Volume (vph)	113	1306	11	1811	34	37	12	45	117
Lane Group Flow (vph)	119	1422	12	1973	0	83	0	60	123
Turn Type	pm+pt	NA	pm+pt	NA	Perm	NA	Perm	NA	pm+ov
Protected Phases	5	2	1	6		8		4	5
Permitted Phases	2		6		8		4		4
Detector Phase	5	2	1	6	8	8	4	4	5
Switch Phase									
Minimum Initial (s)	5.0	7.0	5.0	7.0	7.0	7.0	7.0	7.0	5.0
Minimum Split (s)	11.0	24.0	12.0	24.0	25.0	25.0	25.0	25.0	11.0
Total Split (s)	23.0	99.0	16.0	92.0	55.0	55.0	55.0	55.0	23.0
Total Split (%)	13.5%	58.2%	9.4%	54.1%	32.4%	32.4%	32.4%	32.4%	13.5%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	3.0	2.0	3.0	3.0	3.0	3.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0		0.0	0.0
Total Lost Time (s)	6.0	6.0	7.0	6.0		7.0		7.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag					Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes					Yes
Recall Mode	None	C-Max	None	C-Max	None	None	None	None	None
v/c Ratio	0.56	0.35	0.04	0.53		0.66		0.44	0.51
Control Delay	18.5	5.2	4.0	10.6		95.7		83.2	57.1
Queue Delay	0.0	0.0	0.0	0.0		0.0		0.0	0.0
Total Delay	18.5	5.2	4.0	10.6		95.7		83.2	57.1
Queue Length 50th (ft)	19	104	2	303		88		65	104
Queue Length 95th (ft)	77	218	7	444		148		115	158
Internal Link Dist (ft)		763		1859		253		306	
Turn Bay Length (ft)	140		155						58
Base Capacity (vph)	279	4051	330	3699		423		458	305
Starvation Cap Reductn	0	0	0	0		0		0	0
Spillback Cap Reductn	0	0	0	0		0		0	0
Storage Cap Reductn	0	0	0	0		0		0	0
Reduced v/c Ratio	0.43	0.35	0.04	0.53		0.20		0.13	0.40

Intersection Summary

Cycle Length: 170
Actuated Cycle Length: 170
Offset: 62 (36%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow
Natural Cycle: 70
Control Type: Actuated-Coordinated

Splits and Phases: 3: Michigan Avenue & 5th Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	113	1306	45	11	1811	64	34	37	8	12	45	117
Future Volume (veh/h)	113	1306	45	11	1811	64	34	37	8	12	45	117
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.94	1.00		0.94	0.97		0.94	0.98		0.92
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	119	1375	47	12	1906	67	36	39	8	13	47	123
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	228	3858	132	320	3800	133	75	73	13	49	155	192
Arrive On Green	0.03	0.77	0.77	0.01	0.76	0.76	0.10	0.10	0.10	0.10	0.10	0.10
Sat Flow, veh/h	1767	5017	172	1767	5011	176	442	727	125	235	1538	1448
Grp Volume(v), veh/h	119	925	497	12	1283	690	83	0	0	60	0	123
Grp Sat Flow(s),veh/h/ln	1767	1689	1812	1767	1689	1810	1294	0	0	1774	0	1448
Q Serve(g_s), s	2.6	14.8	14.8	0.3	25.2	25.3	6.1	0.0	0.0	0.0	0.0	13.7
Cycle Q Clear(g_c), s	2.6	14.8	14.8	0.3	25.2	25.3	11.2	0.0	0.0	5.1	0.0	13.7
Prop In Lane	1.00		0.09	1.00		0.10	0.43		0.10	0.22		1.00
Lane Grp Cap(c), veh/h	228	2597	1393	320	2561	1372	161	0	0	204	0	192
V/C Ratio(X)	0.52	0.36	0.36	0.04	0.50	0.50	0.52	0.00	0.00	0.29	0.00	0.64
Avail Cap(c_a), veh/h	353	2597	1393	391	2561	1372	425	0	0	514	0	455
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	8.2	6.3	6.3	5.0	8.0	8.0	74.0	0.0	0.0	71.0	0.0	70.3
Incr Delay (d2), s/veh	0.7	0.4	0.7	0.0	0.7	1.3	1.9	0.0	0.0	0.6	0.0	2.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.1	5.1	5.6	0.1	8.9	9.8	3.6	0.0	0.0	2.5	0.0	5.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	8.9	6.6	7.0	5.0	8.7	9.3	75.9	0.0	0.0	71.6	0.0	72.9
LnGrp LOS	A	A	A	A	A	A	E	A	A	E	A	E
Approach Vol, veh/h		1541			1985			83			183	
Approach Delay, s/veh		6.9			8.9			75.9			72.5	
Approach LOS		A			A			E			E	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	9.2	136.7		24.1	11.0	134.9		24.1				
Change Period (Y+Rc), s	7.0	6.0		7.0	6.0	6.0		7.0				
Max Green Setting (Gmax), s	9.0	93.0		48.0	17.0	86.0		48.0				
Max Q Clear Time (g_c+I1), s	2.3	16.8		15.7	4.6	27.3		13.2				
Green Ext Time (p_c), s	0.0	3.9		0.6	0.1	6.5		0.4				

Intersection Summary												
HCM 6th Ctrl Delay			12.6									
HCM 6th LOS			B									

DRIVEWAYS

Intersection	
Int Delay, s/veh	7.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	59	3	0	0	11	0
Future Vol, veh/h	59	3	0	0	11	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	64	3	0	0	12	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	12	12	12	0	-	0
Stage 1	12	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	1008	1069	1607	-	-	-
Stage 1	1011	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	1008	1069	1607	-	-	-
Mov Cap-2 Maneuver	1008	-	-	-	-	-
Stage 1	1011	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.8	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1607	-	1011	-	-
HCM Lane V/C Ratio	-	-	0.067	-	-
HCM Control Delay (s)	0	-	8.8	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0.2	-	-

Intersection	
Int Delay, s/veh	5.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	83	19	0	0	66	0
Future Vol, veh/h	83	19	0	0	66	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	90	21	0	0	72	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	72	72	72	0	-	0
Stage 1	72	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	932	990	1528	-	-	-
Stage 1	951	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	932	990	1528	-	-	-
Mov Cap-2 Maneuver	932	-	-	-	-	-
Stage 1	951	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.3	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1528	-	942	-	-
HCM Lane V/C Ratio	-	-	0.118	-	-
HCM Control Delay (s)	0	-	9.3	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0.4	-	-

APPENDIX G
TRIP GENERATION DATA

TRIP GENERATION ANALYSIS
411 MICHIGAN

DAILY

Land Use	ITE Code	Size	Trip Generation Rate	In	Out	Total Trips			Pass-by		Net New Trips		
						In	Out	Total	Trips	%	In	Out	Total
Proposed Uses													
General Office	710	200 Employees	Ln (T) = 0.80 Ln(X) + 2.51	50%	50%	427	426	853	0	0%	427	426	853
Shopping Center	820	4,320 SF	Ln (T) = 0.68 Ln(X) + 5.57	50%	50%	355	355	710	0	0%	355	355	710
					Total	**782**	**781**	**1,563**	**0**		**782**	**781**	**1,563**
					Non-vehicular reduction (20%)	156	156	313			156	156	313
					Net-New Trips	**626**	**625**	**1,250**			**626**	**625**	**1,250**

MORNING PEAK HOUR

Land Use	ITE Code	Size	Trip Generation Rate	In	Out	Total Trips			Pass-by		Net New Trips		
						In	Out	Total	Trips	%	In	Out	Total
Proposed Uses													
General Office	710	200 Employees	Ln (T) = 0.72 Ln(X) + 0.56	83%	17%	66	13	79	0	0%	66	13	79
Shopping Center	820	4,320 SF	T = 0.94 (X)	62%	38%	2	2	4	0	0%	2	2	4
					Total	**68**	**15**	**83**	**0**		**68**	**15**	**83**
					Non-vehicular reduction (20%)	14	3	17			14	3	17
					Net-New Trips	**54**	**12**	**66**	**0**	**0**	**54**	**12**	**66**

AFTERNOON PEAK HOUR

Land Use	ITE Code	Size	Trip Generation Rate	In	Out	Total Trips			Pass-by		Net New Trips		
						In	Out	Total	Trips	%	In	Out	Total
Proposed Uses													
General Office	710	200 Employees	T = 0.27 (X) + 23.57	20%	80%	16	62	78	0	0%	16	62	78
Shopping Center	820	4,320 SF	Ln (T) = 0.74 Ln(X) + 2.89	48%	52%	25	28	53	18	34%	16	19	35
					Total	**41**	**90**	**131**	**18**		**32**	**81**	**113**
					Non-vehicular reduction (20%)	8	18	26	4		6	16	23
					Net-New Trips	**33**	**72**	**105**	**14**	**0**	**26**	**65**	**90**

LANGAN
ENGINEERING & ENVIRONMENTAL SERVICES

General Office Building
(710)

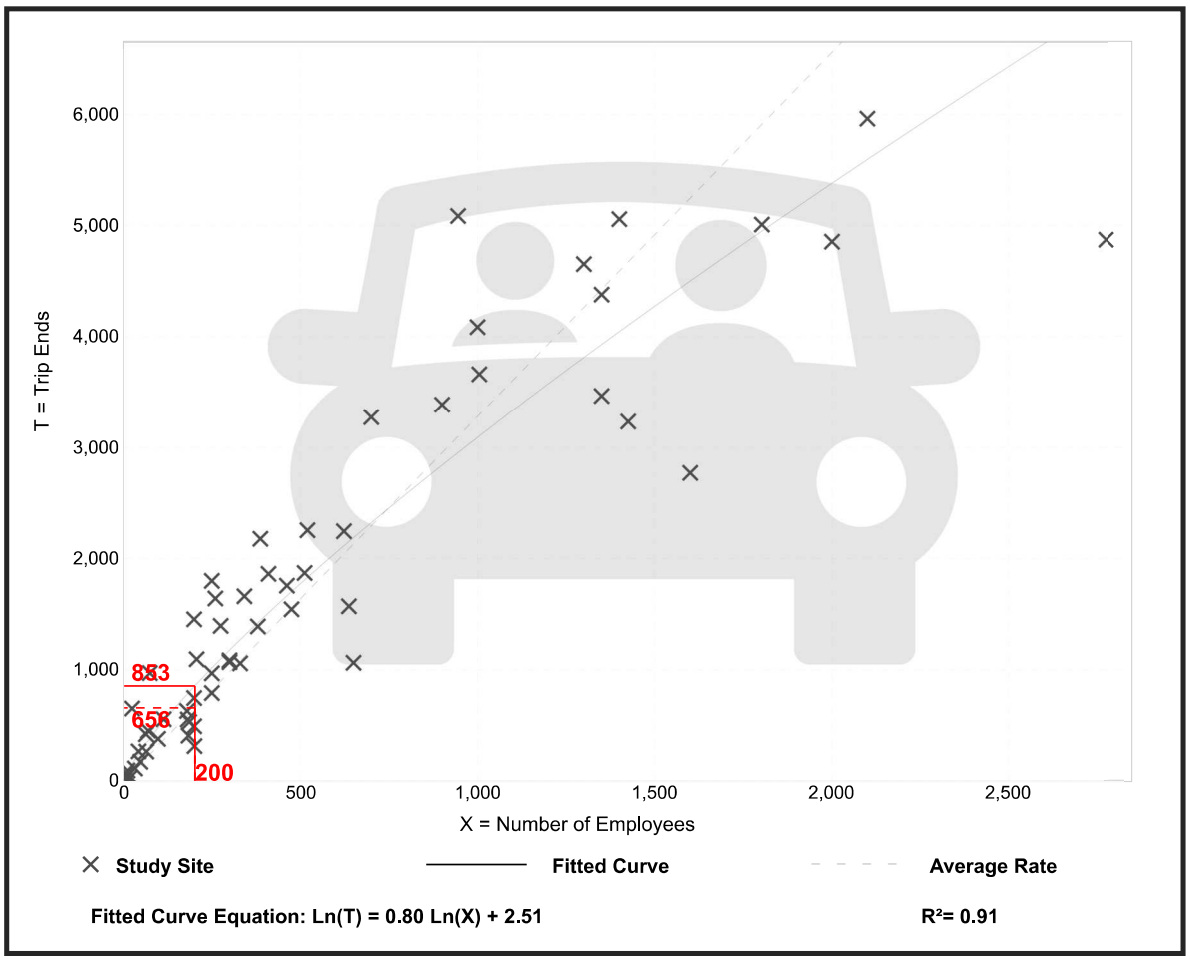
Vehicle Trip Ends vs: **Employees**
On a: **Weekday**

Setting/Location: **General Urban/Suburban**
Number of Studies: 60
Avg. Num. of Employees: 528
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
3.28	1.59 - 26.24	1.44

Data Plot and Equation



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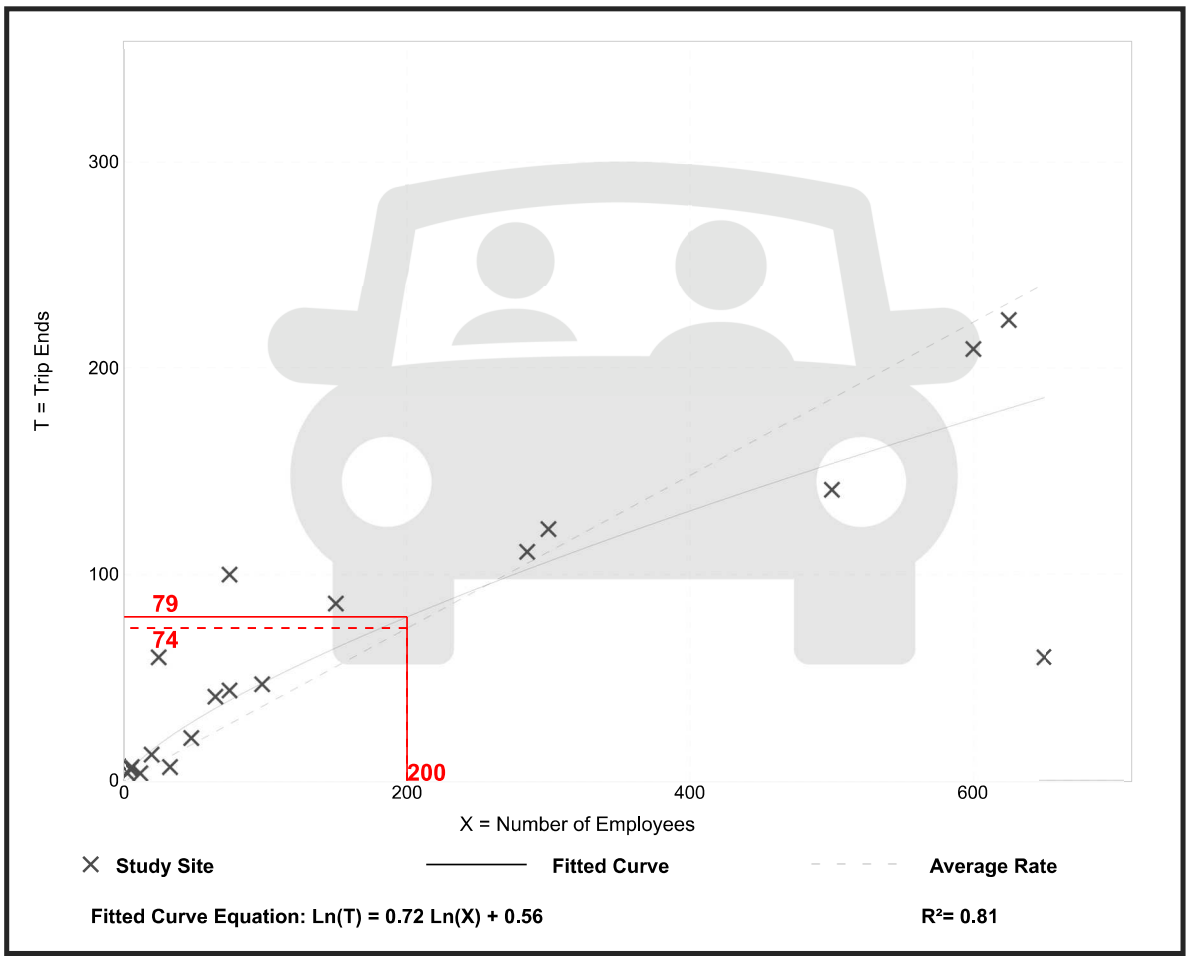
General Office Building
(710)

Vehicle Trip Ends vs: **Employees**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 19
Avg. Num. of Employees: 188
Directional Distribution: 83% entering, 17% exiting

Vehicle Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
0.37	0.09 - 2.40	0.27

Data Plot and Equation



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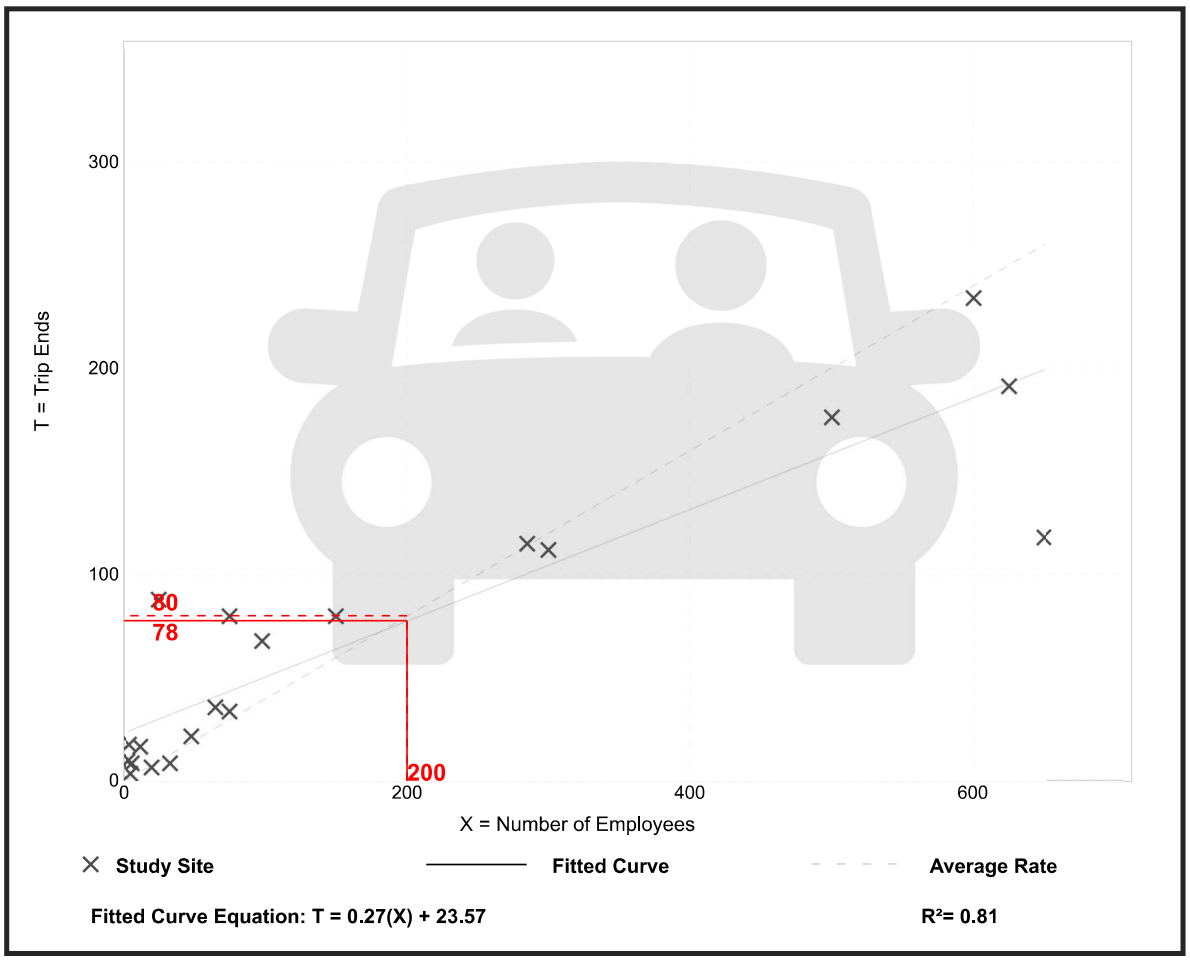
General Office Building
(710)

Vehicle Trip Ends vs: **Employees**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 20
Avg. Num. of Employees: 179
Directional Distribution: 20% entering, 80% exiting

Vehicle Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
0.40	0.18 - 4.50	0.36

Data Plot and Equation



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Shopping Center
(820)

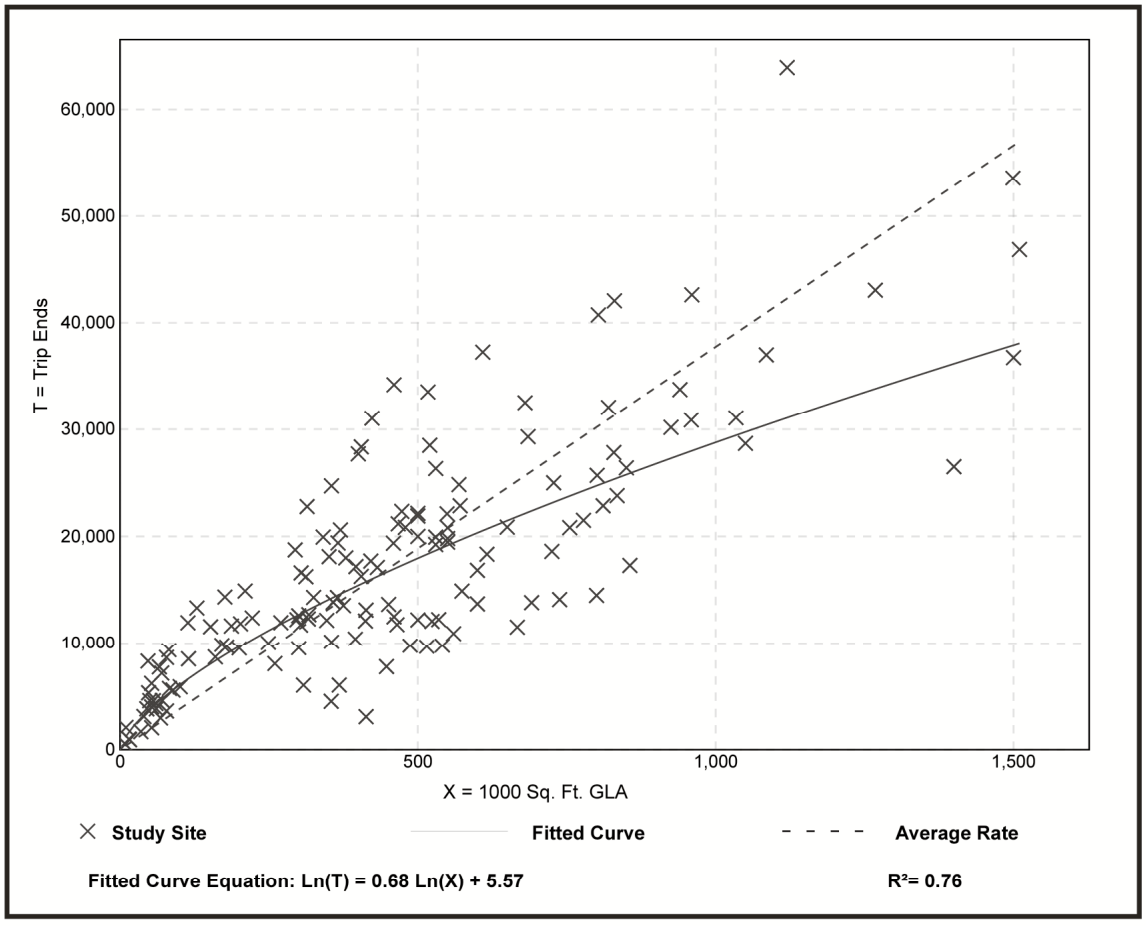
Vehicle Trip Ends vs: **1000 Sq. Ft. GLA**
On a: **Weekday**

Setting/Location: **General Urban/Suburban**
Number of Studies: 147
1000 Sq. Ft. GLA: 453
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GLA

Average Rate	Range of Rates	Standard Deviation
37.75	7.42 - 207.98	16.41

Data Plot and Equation



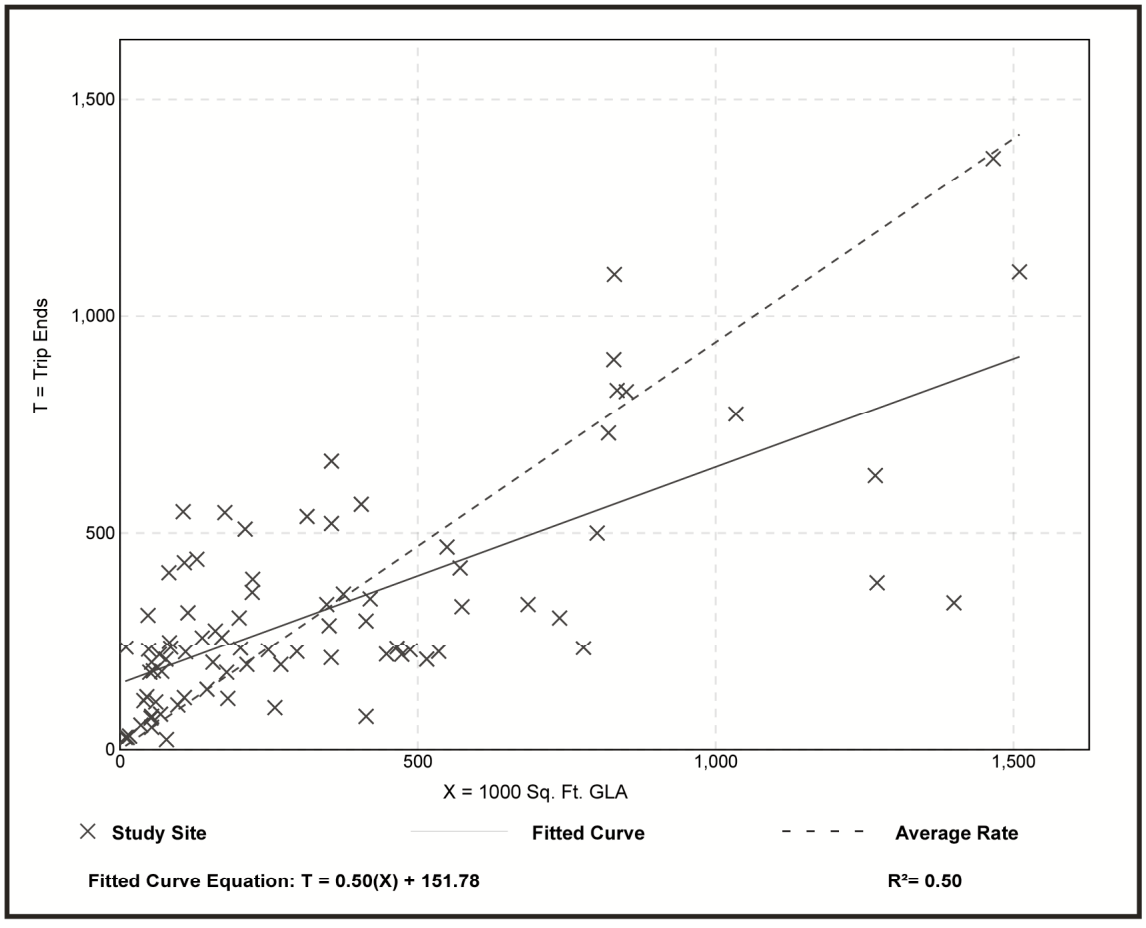
Shopping Center
(820)

Vehicle Trip Ends vs: **1000 Sq. Ft. GLA**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 84
1000 Sq. Ft. GLA: 351
Directional Distribution: 62% entering, 38% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GLA

Average Rate	Range of Rates	Standard Deviation
0.94	0.18 - 23.74	0.87

Data Plot and Equation



Shopping Center
(820)

Vehicle Trip Ends vs: **1000 Sq. Ft. GLA**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 261
1000 Sq. Ft. GLA: 327
Directional Distribution: 48% entering, 52% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GLA

Average Rate	Range of Rates	Standard Deviation
3.81	0.74 - 18.69	2.04

Data Plot and Equation

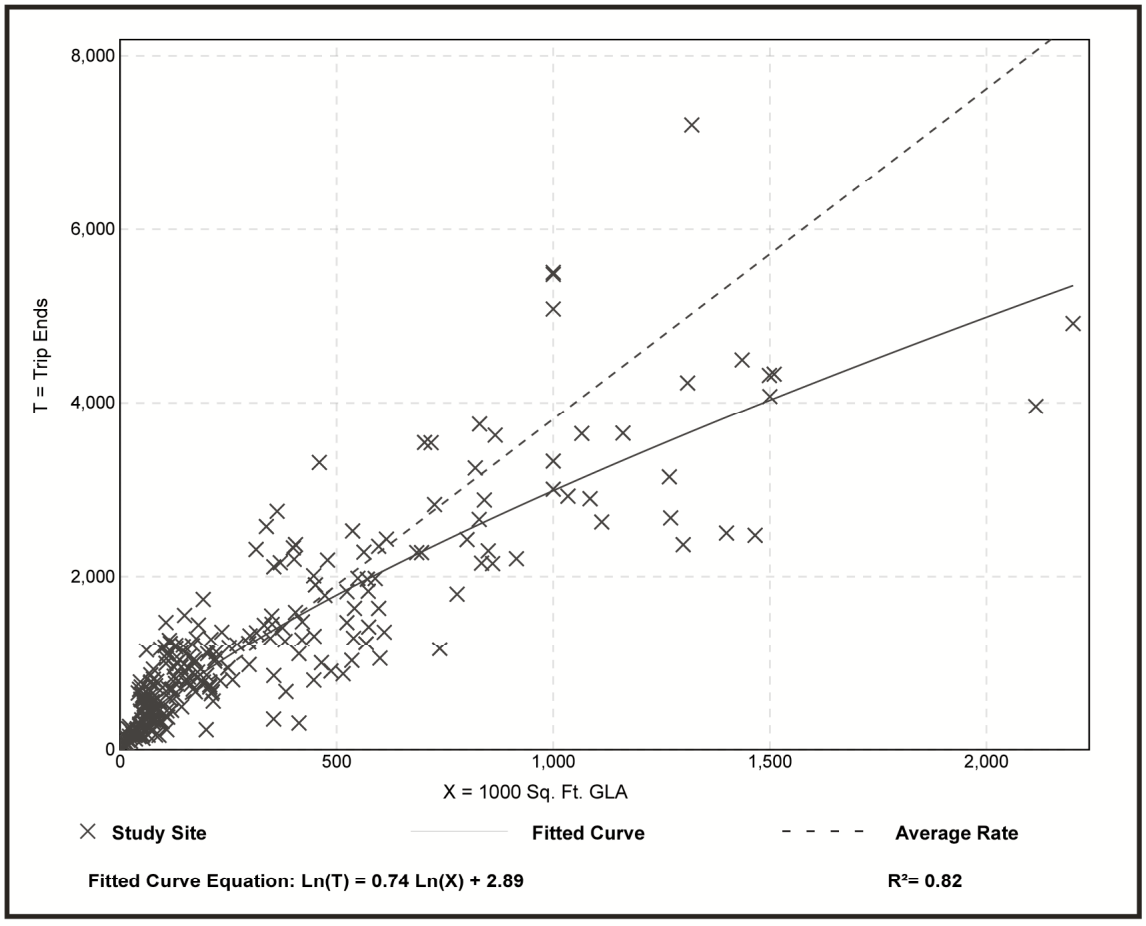


Table E.9 (Cont'd) Pass-By and Non-Pass-By Trips Weekday, PM Peak Period Land Use Code 820—Shopping Center

SIZE (1,000 SQ. FT. GLA)	LOCATION	WEEKDAY SURVEY DATE	NO. OF INTERVIEWS	TIME PERIOD	PASS-BY TRIP (%)	NON-PASS-BY TRIP (%)			ADJ. STREET PEAK HOUR VOLUME	AVERAGE 24-HOUR TRAFFIC	SOURCE
						PRIMARY	DIVERTED	TOTAL			
921	Albany, NY	July & Aug. 1985	196	4:00–6:00 p.m.	23	42	35	77	—	60,950	Raymond Keyes Assoc.
108	Overland Park, KS	July 1988	111	4:30–5:30 p.m.	26	61	13	74	—	34,000	—
118	Overland Park, KS	Aug. 1988	123	4:30–5:30 p.m.	25	55	20	75	—	—	—
256	Greece, NY	June 1988	120	4:00–6:00 p.m.	38	62	—	62	—	23,410	Sear Brown
160	Greece, NY	June 1988	78	4:00–6:00 p.m.	29	71	—	71	—	57,306	Sear Brown
550	Greece, NY	June 1988	117	4:00–6:00 p.m.	48	52	—	52	—	40,763	Sear Brown
51	Boca Raton, FL	Dec. 1987	110	4:00–6:00 p.m.	33	34	33	67	—	42,225	Kimley-Horn and Assoc. Inc.
1,090	Ross Twp, PA	July 1988	411	2:00–8:00 p.m.	34	56	10	66	—	51,500	Wilbur Smith and Assoc.
97	Upper Dublin Twp, PA	Winter 1988/89	—	4:00–6:00 p.m.	41	—	—	59	—	34,000	McMahon Associates
118	Tredyffrin Twp, PA	Winter 1988/89	—	4:00–6:00 p.m.	24	—	—	76	—	10,000	Booz Allen & Hamilton
122	Lawnside, NJ	Winter 1988/89	—	4:00–6:00 p.m.	37	—	—	63	—	20,000	Pennoni Associates
126	Boca Raton, FL	Winter 1988/89	—	4:00–6:00 p.m.	43	—	—	57	—	40,000	McMahon Associates
150	Willow Grove, PA	Winter 1988/89	—	4:00–6:00 p.m.	39	—	—	61	—	26,000	Booz Allen & Hamilton
153	Broward Cnty., FL	Winter 1988/89	—	4:00–6:00 p.m.	50	—	—	50	—	85,000	McMahon Associates
153	Arden, DE	Winter 1988/89	—	4:00–6:00 p.m.	30	—	—	70	—	26,000	Orth-Rodgers & Assoc. Inc.
154	Doylestown, PA	Winter 1988/89	—	4:00–6:00 p.m.	32	—	—	68	—	29,000	Orth Rodgers & Assoc. Inc.
164	Middletown Twp, PA	Winter 1988/89	—	4:00–6:00 p.m.	33	—	—	67	—	25,000	Booz Allen & Hamilton
166	Haddon Twp, NJ	Winter 1988/89	—	4:00–6:00 p.m.	20	—	—	80	—	6,000	Pennoni Associates
205	Broward Cnty., FL	Winter 1988/89	—	4:00–6:00 p.m.	55	—	—	45	—	62,000	McMahon Associates

Table E.9 (Cont'd) Pass-By and Non-Pass-By Trips Weekday, PM Peak Period Land Use Code 820—Shopping Center

SIZE (1,000 SQ. FT. GLA)	LOCATION	WEEKDAY SURVEY DATE	NO. OF INTERVIEWS	TIME PERIOD	PASS-BY TRIP (%)	NON-PASS-BY TRIP (%)			ADJ. STREET PEAK HOUR VOLUME	AVERAGE 24-HOUR TRAFFIC	SOURCE
						PRIMARY	DIVERTED	TOTAL			
237	W. Windsor Twp, NJ	Winter 1988/89	—	4:00–6:00 p.m.	48	—	—	52	—	46,000	Booz Allen & Hamilton
242	Willow Grove, PA	Winter 1988/89	—	4:00–6:00 p.m.	37	—	—	63	—	26,000	McMahon Associates
297	Whitehall, PA	Winter 1988/89	—	4:00–6:00 p.m.	33	—	—	67	—	26,000	Orth-Rodgers & Assoc. Inc.
360	Broward Cnty., FL	Winter 1988/89	—	4:00–6:00 p.m.	44	—	—	56	—	73,000	McMahon Associates
370	Pittsburgh, PA	Winter 1988/89	—	4:00–6:00 p.m.	19	—	—	81	—	33,000	Wilbur Smith
150	Portland, OR	—	519	4:00–6:00 p.m.	68	6	26	32	—	25,000	Kittelson and Associates
150	Portland, OR	—	655	4:00–6:00 p.m.	65	7	28	35	—	30,000	Kittelson and Associates
760	Calgary, Alberta	Oct.-Dec. 1987	15,436	4:00–6:00 p.m.	20	39	41	80	—	—	City of Calgary DOT
178	Bordentown, NJ	Apr. 1989	154	2:00–6:00 p.m.	35	—	—	65	—	37,980	Raymond Keyes Assoc.
144	Manalapan, NJ	July 1990	176	3:30–6:15 p.m.	32	44	24	68	—	69,347	Raymond Keyes Assoc.
549	Natick, MA	Feb. 1989	—	4:45–5:45 p.m.	33	26	41	67	—	48,782	Raymond Keyes Assoc.

Average Pass-By Trip Percentage: 34

"—" means no data were provided

the use of bicycle, pedestrian and transit modes as a means of commuting and recreational mobility. These may include, but are not limited to:

- carpools,
- van pools,
- demand response service,
- public/private provision of transit service,
- bicycle sharing, or shared car initiatives, transfer hubs, transfer stops, parking facilities dedicated to transit patrons, and carpools
- provision of short term and long term bicycle parking, showers and changing facilities,
- provision of parking for carpools,
- alternative hours of travel, including flexible work hours, staggered work shifts, compressed work weeks and telecommuting options,
- subsidy of transit fares,
- use of long term parking to be developed at City's entry points,
- shared vehicular and pedestrian access for compatible land uses, where possible,
- shared parking agreements for compatible land uses, where possible~~,~~.

POLICY TE 1.7.3: INTELLIGENT TRANSPORTATION SYSTEMS

The City shall coordinate with and support FDOT and MDC in the pursuit of Intelligent Transportation Systems (ITS), to help manage congestion on facilities within Miami Beach as well as those facilities connecting the City with the mainland transportation system. This may include using various forms of technology, not limited to cameras, and electronic signage, to inform travelers of the condition of the transportation system, roadway level of service, adaptive signal controls, and availability of parking citywide. Additionally, the City is currently pursuing FDOT independent ITS projects and shall continue to pursue such independent projects to better manage the movement of traffic within the City's transportation network.

POLICY TE 1.7.4: BALANCING MODAL SPLIT

The City shall attempt to better balance the mode split between automobiles and alternative modes of transportation, such as bicycling and transit, particularly in the morning, afternoon and evening peak hour periods. In the meantime, the City will use the TPO's regional model to establish the modal split within the City. The City shall create transit hubs, transit centers and stops to integrate the various modes at one location according to modal priority.

POLICY TE 1.7.5: MODE SPLIT ANALYSIS

The City currently has a transportation mode split of its daily population of 64% private vehicles, 11% mass transit, 10% walking, 5% biking, and 10% others. The City shall strive to achieve its 2035 vision of a minimum transportation mode split of 20% mass transit, 17% walking, 8% bicycling, and 12% other modes through support of and implementation of multimodal transportation improvements.

POLICY TE 1.7.6: MODAL SPLIT DATA COLLECTION

As a tool for accomplishing the desired modal split envisioned for 2035, the city shall perform and retain a series of origin-destination studies in which the modes of transportation used within the city and by different people are recorded. These studies could be performed through surveys of tourists, residents, and commuters provided electronically and capturing a desired sample size.

APPENDIX H
ITE EXCERPTS & QUEUING ANALYSIS CALCULATIONS

Valet Service Time Calculations

411 MICHIGAN VALET OPERATIONS

All Vehicles Enter through the Driveway and exit through the Alley; Alley operates as two-way

Valet Service Time Drop-off	
Activity	**Service Time (min)**
Vehicle Pick-Up	0.40
Vehicle Travel Time (Weighted Avg.)	0.21
Signal Delay Based on Synchro	0.00
Lift Time Get on (Weighted Avg.)	1.51
Car Elevator Time (Weighted Avg.)	1.33
Return to Valet booth (Weighted Avg.)	0.40
Total Service Time	**3.85**

Valet Service Time Pick-up	
Activity	**Service Time (min)**
Get Ticket/Keys	0.15
Pickup Car Time (Weighted Avg.)	0.40
Lift Time Get off (Weighted Avg.)	2.17
Car Elevator Time (Weighted Avg.)	1.33
Vehicle Travel Time (Weighted Avg.)	0.51
Signal Delay Based on Synchro	0.16
Return car	0.20
Total Service Time	**4.92**

Travel Time from Valet Booth to Valet Parking Spaces

	Speed (mph)	Speed (mps)	**Distance to Car Elevator Parking (m)**	Travel Time (sec)
From Valet	10	4.44	60.00	13.50

	Speed (mph)	Speed (mps)	**Distance to Ground Floor Parking (m)**	Travel Time (sec)
From Basement	10	4.44	50.00	11.25

	Speed (mph)	Speed (mps)	**Distance to Basement Floor Parking (m)**	Travel Time (sec)
From Car elevator	10	4.44	0.00	120.00

	Speed (mph)	Speed (mps)	**Distance to Valet Pick-up (m)**	Travel Time (sec)
From Car elevator	10	4.44	180.00	40.50

Valet Parking Spaces		
Lift Spaces Ground Floor	30	spaces
Lift Spaces in the Basement Floor	59	spaces

Valet Operator time to return to Valet Booth		
Return to Valet booth from Basement	1	min
Return to Valet booth from Ground Floor	0.1	min

Lift Time Get On		
Double Stackers Lift-Time*	1	min
Tripple Stackers Lift-Time	2.5	min

Lift Time Get Off		
Double Stackers Lift-Time*	1.5	min
Tripple Stackers Lift-Time	3.5	min

** Assumes one personnel at basement floor controlling lifts.*

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QUEUING ANALYSIS 411 MICHIGAN

Estimated Service Time

Entrance Type	Time (min)*
Drop-off Valet Operation	3.85
Pick-up Valet Operation	4.92

Morning Ingress Peak Hour Valet Parking Queuing Analysis

Peak Hour Arrival Rate (veh/hr): **54**
Probablity of Back-up on Adjacent Street: **5%**
Service Time (min): **3.85**
Number of Operators: **5**

N	Q	q	r	Q_m	M
2	78.00	54	0.3462	0.3676	**0.9**

Morning Egress Peak Hour Valet Parking Queuing Analysis

Peak Hour Arrival Rate (veh/hr): **12**
Probablity of Back-up on Adjacent Street: **5%**
Service Time (min): **4.92**
Number of Operators: **5**

N	Q	q	r	Q_m	M
2	61.00	12	0.0984	0.0166	**0.0**

Afternoon Ingress Peak Hour Valet Parking Queuing Analysis

Peak Hour Arrival Rate (veh/hr): **33**
Probablity of Back-up on Adjacent Street: **5%**
Service Time (min): **3.85**
Number of Operators: **5**

N	Q	q	r	Q_m	M
2	78.00	33	0.2115	0.1597	**0.0**

Afternoon Egress Peak Hour Valet Parking Queuing Analysis

Peak Hour Arrival Rate (veh/hr): **72**
Probablity of Back-up on Adjacent Street: **5%**
Service Time (min): **4.92**
Number of Operators: **5**

N	Q	q	r	Q_m	M
2	61.00	72	0.5902	0.4274	**3.1**

Morning Peak Hour Trip Generation Summary

Land Use	ITE Code	In	Out	Total Trips
General Office	710	53	10	63
Shopping Center	820	1	2	3
	Total	**54**	**12**	**66**

Afternoon Peak Hour Trip Generation Summary

Land Use	ITE Code	In	Out	Total Trips
General Office	710	13	50	63
Shopping Center	820	20	22	42
	Total	**33**	**72**	**105**

r	N=1	2	3	4	6	8	10
0.1	0.1000	0.0182	0.0037	0.0008	0.0000	0.0000	0.0000
0.2	0.2000	0.0666	0.0247	0.0093	0.0015	0.0002	0.0000
0.3	0.3000	0.1385	0.0700	0.0370	0.0111	0.0036	0.0011
0.4	0.4000	0.2286	0.1411	0.0907	0.0400	0.0185	0.0088
0.5	0.5000	0.3333	0.2368	0.1739	0.0991	0.0591	0.0360
0.6	0.6000	0.4501	0.3548	0.2870	0.1965	0.1395	0.1013
0.7	0.7000	0.5766	0.4923	0.4286	0.3359	0.2706	0.2218
0.8	0.8000	0.7111	0.6472	0.5964	0.5178	0.4576	0.4093
0.9	0.9000	0.8526	0.8172	0.7878	0.7401	0.7014	0.6687
1.0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

** ITE Transportation and Development Table 8.11*

Required queuing storage equation:

$$M = \frac{\ln(0.05) - \ln(Q_m)}{\ln \rho} - 1$$

where:

N = Number of Lanes
Q = Average Service Rate (veh/hr)
q = Peak Hour Arrival Rate (veh/hr)
r = Coefficient of Utiliation (q/NQ)
Q_m = ITE table value of relationship between queue length, number of attendants and utilization factor (ITE Transportation and Land Development Table 8.11
M = Queue length which is exceeded 5% of the time (veh)

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CAR ELEVATOR QUEUING ANALYSIS 411 MICHIGAN

Estimated Service Time

Entrance Type	Time (min)*
Elvator Service time	1.33

Morning Peak Hour Valet Parking Queuing Analysis

Peak Hour Arrival Rate (veh/hr): **50**
Probablity of Back-up on Adjacent Street: **5%**
Service Time (min): **1.33**
Number of Operators: **1**

N	Q	q	r	Q_m	M
2	46.00	50	0.5435	0.3841	**2.3**

Afternoon Peak Hour Valet Parking Queuing Analysis

Peak Hour Arrival Rate (veh/hr): **16**
Probablity of Back-up on Adjacent Street: **5%**
Service Time (min): **1.33**
Number of Operators: **1**

N	Q	q	r	Q_m	M
2	46.00	16	0.1739	0.0540	**0.0**

Morning Peak Hour Trip Generation Summary

Land Use	ITE Code	In	Out	Total Trips	% Employees*	Ingress Employee trips
General Office	710	53	10	63	92%	49
Shopping Center	820	1	2	3	100%	1
	Total	**54**	**12**	**66**		**50**

** Employee % based on ULI shared Parking 3rd Edition Figure 2.2*

Afternoon Peak Hour Trip Generation Summary

Land Use	ITE Code	In	Out	Total Trips	% Employees*	Ingress Employee trips
General Office	710	13	50	63	92%	12
Shopping Center	820	20	22	42	20%	4
	Total	**33**	**72**	**105**		**16**

** Employee % based on ULI shared Parking 3rd Edition Figure 2.2*

r	N=1	2	3	4	6	8	10
0.1	0.1000	0.0182	0.0037	0.0008	0.0000	0.0000	0.0000
0.2	0.2000	0.0666	0.0247	0.0093	0.0015	0.0002	0.0000
0.3	0.3000	0.1385	0.0700	0.0370	0.0111	0.0036	0.0011
0.4	0.4000	0.2286	0.1411	0.0907	0.0400	0.0185	0.0088
0.5	0.5000	0.3333	0.2368	0.1739	0.0991	0.0591	0.0360
0.6	0.6000	0.4501	0.3548	0.2870	0.1965	0.1395	0.1013
0.7	0.7000	0.5766	0.4923	0.4286	0.3359	0.2706	0.2218
0.8	0.8000	0.7111	0.6472	0.5964	0.5178	0.4576	0.4093
0.9	0.9000	0.8526	0.8172	0.7878	0.7401	0.7014	0.6687
1.0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

** ITE Transportation and Development Table 8.11*

Required queuing storage equation:

$$M = \frac{\ln(0.05) - \ln(Q_m)}{\ln \rho} - 1$$

where:

N = Number of Lanes
Q = Average Service Rate (veh/hr)
q = Peak Hour Arrival Rate (veh/hr)
r = Coefficient of Utiliation (q/NQ)
Q_m = ITE table value of relationship between queue length, number of attendants and utilization factor (ITE Transportation and Land Development Table 8.11
M = Queue length which is exceeded 5% of the time (veh)

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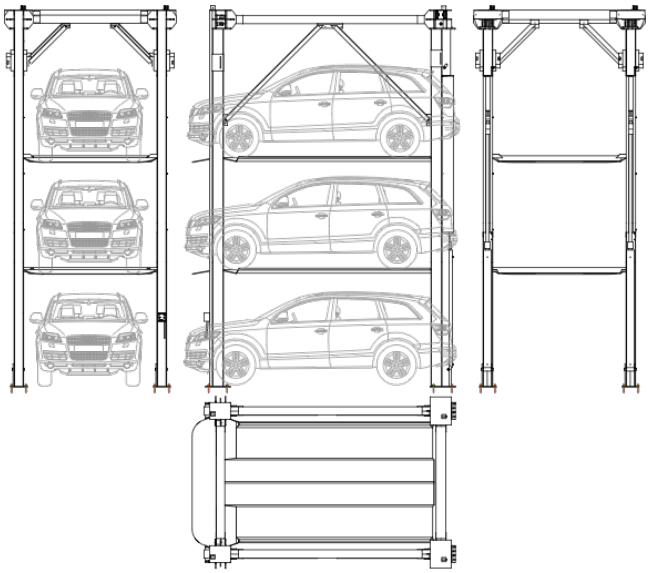
TPS3E



3 HIGH SPECIFICATIONS		
DESCRIPTION	*3 HIGH PARKING STACKER 4 POST*	*3 HIGH PARKING STACKER 4 POST*
OPERATION TYPE	*ELECTRICAL*	*HYDRAULIC*
CONTROL METHOD	*PUSH BUTTON*	*PUSH BUTTON*
LENGTH	*15'*	*15'*
WIDTH	*8'-3" - to - 8'-8"*	*8'-3" - to - 8'-8"*
HEIGTH	*18' - to - 24'*	*18' - to - 24'*
CLEARANCE REQUIREMENTS	*24'-10"*	*24'-10"*
DRIVE	*ELECTRICAL MOTORS*	*HYDRAULIC POWER PACKS*
WEIGHT OF LIFT	*8500LBS*	*8500LBS*
LIFTING SPEED	*14ft / MIN*	*10ft / MIN*
LIFTING CAPACITY OF PLATFORMS	*6,000 LBS PER PLATFORM*	*6,000 LBS PER PLATFORM*
SAFETY	*ANTI FALL*	*ANTI FALL*
ELECTRICAL	*3PH 208-480V 40AMP*	*3PH 208-480V 40AMP*
BASE REQUIREMENTS	*REINFORCED CONCRETE SLAB*	*REINFORCED CONCRETE SLAB*

AMERICAN CAR LIFT

227 US Highway 206, Byram Township NJ 07821

INSTITUTE
OF
TRANSPORTATION ENGINEERS

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APPLICATIONS OF QUEUEING ANALYSIS

Providing an adequate and well-defined storage area for drive-thru traffic is particularly critical, especially at fast-food restaurants and drive-thru bank facilities where queues can, and do, become quite long. Waiting vehicles should be stored on private property clear of driveways so that traffic back-up does not interfere with movement on the arterial street. At fast-food restaurants, the menu board should be installed upstream of the service window to permit drive-thru customers to place their orders prior to their arrival at the service window. Preparation of their order can then begin before they reach the service window, thus minimizing their time at the service window. A well-defined storage area for the waiting traffic should be located so that the waiting vehicles do not block or impede the movement of driveway traffic.

Where a single service position is involved, the situation is referred to as a *single-channel problem*. *Multiple-channel problems* arise when two or more service positions are available. Such problems commonly arise with bank tellers (indoor as well as drive-in windows), entrances and exits at large parking lots and garages, at passenger pick-up areas at transit stations and taxi stands, truck terminals or loading/unloading areas, supermarket checkout counters, telephone calls, building entrances, and transit-station turnstiles. The assumptions of Poisson arrivals and negative exponential service time are commonly acceptable and used for both single- and multiple-channel problems. Thurgood [11] found these assumptions to be representative of drive-in facilities.

Customers arriving randomly at a drive-in facility may enter into service immediately or may have to enter the queue until they can be served. Waiting lines occur whenever the immediate demand for service exceeds the current capacity of the facility providing that service.

Basic Notation and Terminology

The following notation is employed throughout this section:

n = number of customers in the drive-in system
M = number of customers in the queue waiting to be served (number of customers in the system minus the number being served)
$P(n)$ = steady-state probability that exactly n customers are in the queueing system
$P(0)$ = probability that zero vehicles are in the queueing system
N = number of parallel service positions
q = mean average arrival rate of vehicles into the system (vehicles/hour)
Q = mean average service rate per service position (vehicles/hour/position)
Avg (t) = $\%Q$ = mean service time expressed in minutes per vehicle
ρ = $\%Q$ = coefficient of utilization
$E(m)$ = expected (average) number of customers in the system
$E(n)$ = expected (average) number of customers waiting in the queue
$E(t)$ = expected (average) waiting time in system (includes service time)
$E(w)$ = expected (average) waiting time in queue (excludes service time)

The equations employed in the analysis of queueing problems are given in Table 8-10.

Jones, Woods, and Thurgood [4] have developed a graph (Figure 8-6) for determining the probability that there will be no customers in the system—values for $P(0)$. They also developed graphs for determining the average number of waiting customers (Figure 8-7), the average waiting time (Figure 8-8), and average queue length (Figure 8-9). These figures avoid the necessity to perform the time-consuming, although simple, queueing-analysis calculations. See pp. 228–30.

TABLE 8-10
Queueing System Equations

Equation Number	Variable	Equation
(8-1)	Coefficient of utilization	$\rho = \frac{q}{NQ}$
(8-2)	Probability of no customers in the system	$P(0) = \left[\sum_{n=0}^{N-1} \frac{\left(\frac{q}{Q}\right)^n}{n!} + \frac{\left(\frac{q}{Q}\right)^N}{N!(1-\rho)}\right]^{-1}$
(8-3)	Mean number in the queue	$E(m) = \left[\frac{\rho\left(\frac{q}{Q}\right)^N}{N!(1-\rho)^2}\right] P(0)$
(8-4)	Mean number in the system	$E(n) = E(m) + \frac{q}{Q}$
(8-5)	Mean wait time in queue (hours)	$E(w) = \frac{E(m)}{q}$
(8-6)	Mean time in the system (hours)	$E(t) = E(w) + \frac{1}{Q}$ $= E(w) + \text{Avg}\ (t)$
(8-7)	Proportion of customers who wait	$P[E(w) > 0] = \left[\frac{\left(\frac{q}{Q}\right)^N}{N!(1-\rho)}\right] P(0)$
(8-8)	Probability of a queue exceeding a length M	$P(x > M) = (\rho^{N+1}) P[E(w) > 0]$
(8-9a)	Queue storage required	$M = \left[\frac{\ln P(x > M) - \ln E(w) > 0}{\ln \rho}\right] - 1$
(8-9b)*	Queue storage required	$M = \left[\frac{\ln P(x > M) - \ln Q_M}{\ln \rho}\right] - 1$

*Q_M is a statistic which is a function of the utilization rate and the number of service channels (service positions); see Table 8-11. The table of Q_M values and use of Equation (8-9b) greatly simplifies the calculations compared to those using Equations (8-9a).

Use of the equations and the graphs may be illustrated by the following example of a drive-in bank.

Conditions:

Number of drive-in windows, $N = 3$

Demand on the system, $q = 70$

Service capacity per channel, $Q = 28.6$ for an average service time, Avg $(t) = 2.1$ minutes

Solution Using Graphs:

- Coefficient of utilization $= 70/(3)(28.6) = 0.816$
- Probability that there are customers waiting in the system, Figure 8-6: $P(0) = 0.05$
- Expected average number of customers waiting in the queue, Figure 8-7: $E(m)/N = 1.0$; and the average number $E(m) = (3)(1.0) = 3$

location, a 5% probability of back-up onto the adjacent street is judged to be acceptable. Demand on the system for design is expected to be 110 vehicles in a 45-minute period. Average service time was expected to be 2.2 minutes. Is the queue storage adequate?

Such problems can be quickly solved using Equation (8–9b) given in Table 8-10 and repeated below for convenience.

$$M = \left[\frac{\ln P(x > M) - \ln Q_M}{\ln \rho}\right] - 1$$

where:

M = queue length which is exceeded p percent of the time
N = number of service channels (drive-in positions)
Q = service rate per channel (vehicles per hour)
$\rho = \dfrac{\text{demand rate}}{\text{service rate}} = \dfrac{q}{NQ}$ = utilization factor
q = demand rate on the system (vehicles per hour)
Q_M = tabled values of the relationship between queue length, number of channels, and utilization factor (see Table 8.11)

TABLE 8-11
Table of Q_M Values

	$N = 1$	2	3	4	6	8	10
0.0	0.0000	0.0000	0.0000	0.0000			
0.1	.1000	.0182	.0037	.0008	.0000	0.0000	0.0000
.2	.2000	.0666	.0247	.0096	.0015	.0002	.0000
.3	.3000	.1385	.0700	.0370	.0111	.0036	.0011
.4	.4000	.2286	.1411	.0907	.0400	.0185	.0088
.5	.5000	.3333	.2368	.1739	.0991	.0591	.0360
.6	.6000	.4501	.3548	.2870	.1965	.1395	.1013
.7	.7000	.5766	.4923	.4286	.3359	.2706	.2218
.8	.8000	.7111	.6472	.5964	.5178	.4576	.4093
.9	.9000	.8526	.8172	.7878	.7401	.7014	.6687
1.0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

$\rho = \dfrac{q}{NQ} = \dfrac{\text{arrival rate, total}}{(\text{number of channels})(\text{service rate per channel})}$
N = number of channels (service positions)

Solution

Step 1: $Q = \dfrac{60 \text{ min/hr}}{2.2 \text{ min/service}} = 27.3$ services per hour

Step 2: $q = (110 \text{ veh}/45 \text{ min}) \times (60 \text{ min/hr}) = 146.7$ vehicles per hour

Step 3: $\rho = \dfrac{q}{NQ} = \dfrac{146.7}{(6)(27.3)} = 0.8956$

Step 4: $Q_M = 0.7303$ by interpolation between 0.8 and 0.9 for $N = 6$ from the table of Q_M values (see Table 8-11).

Step 5: The acceptable probability of the queue, M, being longer than the storage, 18 spaces in this example, was stated to be 5%. $P(x > M) = 0.05$, and:

$$M = \left[\frac{\ln 0.05 - \ln 0.7303}{\ln 0.8956}\right] - 1 = \left[\frac{-2.996 - (-0.314)}{-0.110}\right] - 1$$

$$= 24.38 - 1 = 23.38, \text{ say } 23 \text{ vehicles.}$$

The number of vehicles in the queue would be expected to exceed 23 more than 5% of the time. Since the site plan will accommodate a queue of 18 vehicles, the storage is not sufficient for the conditions stated.

It is important to realize that, for any $P\ (x > M)$ value, the queue length required increases very rapidly for values of $\rho > 0.85$ (see Figure 8-9). When $\rho > 1.0$, the solution is indeterminate and the queue length theoretically becomes infinite.

Analysis of Service Times. In many instances it is effective to demonstrate that a proposed design not only is inadequate to store vehicles waiting for service but will result in unacceptable wait times as well. The necessary equations are given in Table 8-10.

For purposes of checking computations it is convenient to know that the limit of $P(0)$, as the number of channels approaches infinity (in practical terms when $N > 10$), is:

$$\lim_{N \to \infty} P(0) = e^{-\lambda} \qquad \text{where } \lambda = q/Q$$

Drive-In Bank Example: Under the site-development approval requirements, representatives of a bank presented a site plan for the construction of a new bank having three service positions. Information provided by bank officials and observations at other local banks provided the following data:

- Expected average arrival rate during the design hour (4:30–5:30 p.m. on Fridays) = 70 vehicles per hour (vph)
- Average service time per customer = 2.1 minutes

Does the site plan provide for sufficient storage to accommodate all vehicles arriving 95% of the time?

$$q = 70 \text{ vph arrival rate}$$

$$Q = \frac{60 \text{ minutes per hour}}{2.1 \text{ minutes per service}} = 28.6 \text{ vph service rate}$$

$$\rho = \frac{70}{(3)(28.6)} = 0.816$$

$$\frac{q}{Q} = \frac{70}{28.6} = 2.45$$

$$Q_M = 0.674 \text{ by interpolation from Table 8-11}$$

$$P(x > M) = 1.00 - 0.95 = 0.05$$

By Equation (8-9b)

$$M = \left[\frac{\ln 0.05 - \ln 0.674}{\ln 0.816}\right] - 1 = \left[\frac{-2.996 - (-0.396)}{-0.203}\right] - 1 = 11.8, \text{ say } 12$$

Thus, it would be necessary to store 12 vehicles, exclusive of the three service positions, in order to accommodate the arriving vehicles 95% of the time; or alternatively, to have waiting vehicles extending back into the adjacent street no more than 5% of the time between 4:30 and 5:30 p.m. on Fridays. Since the site plan provides for six spaces, the site plan as submitted is inadequate and should be disapproved.

A solution to the problem would be to increase the storage, or if this is not possible add a service position in order to reduce the average service time.

Addition of a service position would reduce the number of storage spaces needed to three (three storage plus four service positions)—assuming the same arrival rate and service time:

$$M = \left[\frac{\ln 0.05 - \ln 0.301}{\ln 0.612}\right] - 1 = 2.7, \text{ say } 3$$

A redesign to provide four service positions would have the additional benefit of substantially reducing the expected waiting time (from over 4 minutes to less than $\frac{1}{2}$ minute) for the bank customers using the drive-in windows:

With Three Service Positions:

$$q = 70 \text{ vph}$$
$$Q = 28.6 \text{ vph}$$
$$\frac{q}{Q} = 2.45$$
$$\rho = \frac{70}{(3)(28.6)} = 0.816$$
$$P(0) = \left[\frac{(2.45)^0}{0!} + \frac{(2.45)^1}{1!} + \frac{(2.45)^2}{2!} + \frac{(2.45)^3}{3!\left[1 - \left(\frac{2.45}{3}\right)\right]}\right]^{-1}$$
$$= [1 + 2.45 + 3.00 + 13.37]^{-1} = 0.0505$$
$$E(m) = \left[\frac{(0.816)\left(\frac{70}{28.6}\right)^3}{3!(1 - 0.816)^2}\right] 0.0505 = 2.97$$
$$E(n) = 2.97 + \frac{70}{28.6} = 5.42$$
$$E(t) = \frac{2.97}{70} = 0.0424 \text{ hours or } 2.55 \text{ minutes}$$
$$E(w) = 0.0424 + \frac{1}{28.6} = 0.0774 \text{ hours or } 4.64 \text{ minutes}$$

With Four Service Positions:

$$q = 70 \text{ vph}$$
$$Q = 28.6 \text{ vph}$$
$$\frac{q}{Q} = 2.45$$
$$\rho = \frac{70}{(4)(28.6)} = 0.612$$
$$P(0) = \left[\frac{(2.45)^0}{0!} + \frac{(2.45)^1}{1!} + \frac{(2.45)^2}{2!} + \frac{(2.45)^3}{3!} + \frac{(2.45)^4}{4!\left[1 - \left(\frac{2.45}{4}\right)\right]}\right]^{-1}$$
$$= 0.0783$$
$$E(m) = \left[\frac{(0.612)(2.45)^4}{4!(1 - 0.612)^2}\right] 0.0783 = 0.48$$
$$E(n) = 0.48 + 2.45 = 2.93$$
$$E(t) = 0.007 + \frac{1}{28.6} = 0.042 \text{ hours or } 2.51 \text{ minutes}$$
$$E(w) = \frac{0.48}{70} = 0.007 \text{ hours or } 0.41 \text{ minutes}$$

However, the service time would increase somewhat unless an additional teller were also added. Nevertheless, an increase to 2.5 minutes, or more, would still reduce the storage space required and result in better service (less time in the system). Besides, time spent being served is less irritating to the customer than an equal time spent waiting.

Conversion of a Residence. An existing single-family residence was situated on a 2.5-acre tract fronting on the major north–south arterial in the urbanizing fringe of a metropolitan area of 100,000 population. The 85th percentile speed exceeded 50 mph; however, it was anticipated that the speed limit would be reduced to 45 mph as further urbanization occurred.

Requests for rezoning from single-family residential to general commercial had received negative recommendations from the Planning and Zoning Commission and denied by the City Council. Nevertheless, the fact that changing conditions in the vicinity of the site were making the property less desirable as a single-family residence was generally recognized. Therefore, when an application was submitted for a Conditional Use Permit to establish a private school using the existing residence for classrooms, the Planning and Zoning Commission was very favorably disposed to the request. The applicant provided the following information prior to the public hearing.

1. The completed application for a conditional use
2. A statement that the intended use was for a Montessori school using the existing structure
3. A site plan as required for all proposed development, other than single-family and duplex residential development, before a building permit will be issued for a new structure and for remodeling of an existing one

The following information was presented at the public hearing by the applicant:

1. At least 40 students would be enrolled before any change would be made in the site circulation.
2. Eighty percent of the students were expected to be picked up within a 20-minute period—a substantial additional fee was to be charged for children picked up more than 30 minutes after school.
3. A strong parent–school relationship was intended, so that average pick-up time of at least 2 minutes and visits of 5 minutes or longer would not be unusual.

The following were agreed upon at the public hearing:

1. The probability of vehicles backing up onto the main lane of the major arterial should be negligible, less than 1%.
2. The site plan, with no change in the circulation pattern, would provide for four service positions and three storage positions.

Based upon these conditions, the following analysis was performed using Equation (8-9b):

$$M = 3$$

$$N = 4$$

$$Q = 60 \text{ minutes per hour} \div 2 \text{ minutes per service} = 30 \text{ vph}$$

$$q = (40 \text{ students})\,(80\% \text{ in } 20 \text{ minutes})\left(\frac{60}{20}\right) = 96 \text{ vph}$$

$$\rho = \frac{96}{(4)\,(30)} = 0.8000$$

$$P(x > 3) = 0.01 \text{ (a 1\% chance of vehicles backing up onto the arterial)}$$

$$Q_M = 0.8585, \text{ from Table 8-11}$$

$$3 = \left[\frac{\ln P(x > 3) - \ln 0.5964}{\ln 0.8000}\right] - 1$$

$$3 = \left[\frac{\ln P(x > 3) - (-0.5168)}{-0.2231}\right] - 1$$

Then,

$$\ln P(x > 3) = (4)(-0.2231) - 0.5168 = -1.4092$$

and

$$P(x > 3) = e^{-1.4092} = 0.244 \text{ or } 24\%$$

Thus, the calculated probability that the queue could back up onto the arterial is 24% (given the stated conditions), which is considerably greater than the acceptable probability of less than 1%, and the application was denied. The Planning and Zoning Commission suggested various compromises of redesign of the site and issuance of a conditional use permit for a school (under the ordinance, a school can be located in any zoning district by condition) with the condition that the maximum enrollment would not exceed 24 students, which is the number necessary to achieve a value of $P(x > 3) < 0.01$. All such proposals were rejected by the applicant. The site was subsequently rezoned to the Administrative and Professional District (a restricted office district) and is now being used as a dentist's office.

REFERENCES

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