

APPENDIX A

**Crash Data Summary
Quincy Police Crash Reports
January 2015–November 2019**

**Summary of Crash Data
Quincy Police Crash Reports January 2015–November 2019**

Index	Crash Date	Day	Time	Crash Severity	Manner of Collision	Road Conditions	Ambien Light Conditions	Weather Conditions	Vehicle Action Veh #1	Vehicle Action Veh #2	Most Harmful Event	Driver Contributing Code
1	1/9/2015	Friday	14:02	PDO	Angle	Wet	Daylight	Clear	Turning left	Travelling straight ahead	Collision with motor vehicle in traffic	Failed to yield right of way
2	1/10/2015	Saturday	23:16	PDO	Sideswipe,same direction	Dry	Dark - lighted roadway	Clear	Travelling straight ahead	Parked	Collision with motor vehicle in traffic	Unknown
3	1/29/2015	Thursday	15:37	PDO	Angle	Wet	Daylight	Clear	Turning left	Travelling straight ahead	Collision with motor vehicle in traffic	Failed to yield right of way
4	4/5/2015	Sunday	19:30	Non-fatal-injury	Angle	Dry	Dusk	Clear	Travelling straight ahead	Travelling straight ahead	Collision with motor vehicle in traffic	Other improper action
5	4/9/2015	Thursday	8:57	PDO	Angle	Wet	Daylight	Rain	Turning left	Travelling straight ahead	Collision with motor vehicle in traffic	Failed to yield right of way
6	4/18/2015	Saturday	12:06	Non-fatal-injury	Angle	Dry	Daylight	Clear	Entering traffic lane	Travelling straight ahead	Collision with motor vehicle in traffic	No improper driving
7	4/23/2015	Thursday	8:31	PDO	Angle	Dry	Daylight	Clear	Entering traffic lane	Travelling straight ahead	Collision with motor vehicle in traffic	Distracted
8	5/4/2015	Monday	14:55	PDO	Sideswipe,same direction	Dry	Daylight	Clear	Travelling straight ahead	Turning left	Collision with motor vehicle in traffic	Made an improper turn
9	5/27/2015	Wednesday	11:03	PDO	Rear-end	Dry	Daylight	Clear	Turning right	Turning right	Collision with motor vehicle in traffic	Operating defective equipment
10	5/31/2015	Sunday	13:09	PDO	Head on	Dry	Daylight	Cloudy	Travelling straight ahead	Turning left	Collision with motor vehicle in traffic	Failed to yield right of way
11	6/8/2015	Monday	17:54	PDO	Angle	Dry	Daylight	Cloudy	Travelling straight ahead	Entering traffic lane	Collision with motor vehicle in traffic	Failed to yield right of way
12	6/17/2015	Wednesday	7:26	PDO	Angle	Dry	Daylight	Clear	Entering traffic lane	Travelling straight ahead	Collision with motor vehicle in traffic	Inattention
13	6/27/2015	Saturday	21:21	PDO	Angle	Wet	Dark - lighted roadway	Rain	Travelling straight ahead	Travelling straight ahead	Collision with motor vehicle in traffic	No improper driving
14	7/21/2015	Tuesday	16:00	Non-fatal-injury	Angle	Dry	Daylight	Clear	Travelling straight ahead	Entering traffic lane	Collision with motor vehicle in traffic	Unknown
15	8/10/2015	Monday	14:48	PDO	Rear-end	Dry	Daylight	Clear	Slowing or stopped	Travelling straight ahead	Collision with motor vehicle in traffic	Inattention
16	8/27/2015	Thursday	18:40	Non-fatal-injury	Angle	Dry	Dusk	Clear	Turning left	Travelling straight ahead	Collision with motor vehicle in traffic	Failed to yield right of way
17	9/17/2015	Thursday	21:26	PDO	Sideswipe,same direction	Dry	Dark - lighted roadway	Clear	Parked		Collision with parked motor vehicle	
18	9/18/2015	Friday	14:22	Non-fatal-injury	Unknown	Dry	Daylight	Clear	Backing		Collision with pedestrian	Unknown
19	10/7/2015	Wednesday	17:20	Non-fatal-injury	Angle	Dry	Daylight	Clear	Travelling straight ahead	Turning left	Collision with motor vehicle in traffic	Inattention
20	10/18/2015	Sunday	17:48	PDO	Rear-end	Dry	Dusk	Clear	Slowing or stopped	Slowing or stopped	Collision with motor vehicle in traffic	Followed too closely
21	10/29/2015	Thursday	15:53	Non-fatal-injury	Single vehicle crash	Dry	Daylight	Clear	Slowing or stopped		Collision with pedestrian	Unknown
22	11/12/2015	Thursday	16:37	Non-fatal-injury	Angle	Wet	Dark - lighted roadway	Rain	Travelling straight ahead	Turning left	Collision with motor vehicle in traffic	Failed to yield right of way
23	11/30/2015	Monday	17:23	PDO	Sideswipe,same direction	Dry	Dark - lighted roadway	Clear	Travelling straight ahead	Travelling straight ahead	Collision with motor vehicle in traffic	Inattention
24	12/8/2015	Tuesday	16:35	PDO	Angle	Wet	Dark - lighted roadway	Rain	Travelling straight ahead	Travelling straight ahead	Collision with motor vehicle in traffic	Unknown
25	12/20/2015	Sunday	12:12	PDO	Angle	Dry	Daylight	Clear	Travelling straight ahead	Travelling straight ahead	Collision with motor vehicle in traffic	Disregarded traffic signs, signals, road markings
26	12/22/2015	Tuesday	19:24	Non-fatal-injury	Angle	Wet	Dark - lighted roadway	Rain	Slowing or stopped	Travelling straight ahead	Collision with motor vehicle in traffic	Unknown
27	1/15/2016	Friday	8:01	PDO	Sideswipe,same direction	Dry	Daylight	Clear	Travelling straight ahead	Changing lanes	Collision with motor vehicle in traffic	Inattention
28	2/25/2016	Thursday	7:08	PDO	Rear-end	Wet	Daylight	Rain	Slowing or stopped	Travelling straight ahead	Collision with motor vehicle in traffic	Inattention
29	3/9/2016	Wednesday	13:34	PDO	Angle	Dry	Daylight	Clear	Travelling straight ahead	Turning left	Collision with motor vehicle in traffic	Failed to yield right of way
30	3/12/2016	Saturday	16:04	Non-fatal-injury	Sideswipe,opposit direction	Dry	Daylight	Clear	Travelling straight ahead	Travelling straight ahead	Collision with motor vehicle in traffic	Inattention
31	3/22/2016	Tuesday	7:56	PDO	Angle	Dry	Daylight	Clear	Travelling straight ahead	Turning left	Collision with motor vehicle in traffic	No improper driving
32	5/15/2016	Sunday	17:44	PDO	Sideswipe,same direction	Dry	Daylight	Cloudy	Travelling straight ahead	Travelling straight ahead	Collision with motor vehicle in traffic	
33	5/20/2016	Friday	18:55	PDO	Angle	Dry	Daylight	Clear	Turning left	Travelling straight ahead	Collision with motor vehicle in traffic	Unknown
34	5/28/2016	Saturday	18:32	PDO	Angle	Dry	Daylight	Clear	Backing	Travelling straight ahead	Collision with motor vehicle in traffic	Unknown
35	7/17/2016	Sunday	19:06	Non-fatal-injury	Rear-end	Dry	Dusk	Clear	Travelling straight ahead	Slowing or stopped	Collision with motor vehicle in traffic	Glare
36	7/18/2016	Monday	14:33	PDO	Angle	Dry	Daylight	Clear	Travelling straight ahead	Turning left	Collision with motor vehicle in traffic	Made an improper turn
37	7/27/2016	Wednesday	21:25	Non-fatal-injury	Angle	Dry	Dark - lighted roadway	Clear	Turning left	Travelling straight ahead	Collision with motor vehicle in traffic	Failed to yield right of way
38	8/3/2016	Wednesday	11:20	PDO	Sideswipe,same direction	Dry	Daylight	Clear	Changing lanes	Travelling straight ahead	Collision with motor vehicle in traffic	Inattention
39	9/8/2016	Thursday	16:24	Non-fatal-injury	Angle	Dry	Daylight	Clear	Entering traffic lane	Travelling straight ahead	Collision with motor vehicle in traffic	Failure to keep in proper lane or running off road
40	9/9/2016	Friday	18:13	PDO	Angle	Dry	Daylight	Clear	Turning left	Travelling straight ahead	Collision with motor vehicle in traffic	Failed to yield right of way
41	10/1/2016	Saturday	12:21	PDO	Angle	Wet	Daylight	Rain	Travelling straight ahead	Entering traffic lane	Collision with motor vehicle in traffic	Visibility obstructed
42	11/7/2016	Monday	11:26	Non-fatal-injury	Angle	Dry	Daylight	Clear	Travelling straight ahead	Entering traffic lane	Collision with motor vehicle in traffic	Failed to yield right of way
43	11/11/2016	Friday	17:45	PDO	Rear-end	Dry	Dark - lighted roadway	Clear	Travelling straight ahead	Slowing or stopped	Collision with motor vehicle in traffic	Inattention
44	11/18/2016	Friday	8:28	PDO	Single vehicle crash	Dry	Daylight	Clear	Travelling straight ahead		Collision with curb	No improper driving
45	1/6/2017	Friday	18:14	Non-fatal-injury	Angle	Dry	Dark - lighted roadway	Cloudy	Travelling straight ahead	Travelling straight ahead	Collision with motor vehicle in traffic	Operating vehicle in erratic, rackless, careless, negligent or aggressive manner
46	1/19/2017	Thursday	17:18	PDO	Angle	Dry	Dark - lighted roadway	Clear	Turning left	Travelling straight ahead	Collision with motor vehicle in traffic	Made an improper turn
47	1/26/2017	Thursday	16:03	PDO	Angle	Wet	Daylight	Rain	Turning left	Travelling straight ahead	Collision with motor vehicle in traffic	Failed to yield right of way
48	1/27/2017	Friday	17:52	PDO	Angle	Dry	Dark - lighted roadway	Clear	Turning left	Travelling straight ahead	Collision with motor vehicle in traffic	Failed to yield right of way
49	2/16/2017	Thursday	17:04	PDO	Angle	Dry	Daylight	Clear	Turning right	Travelling straight ahead	Collision with motor vehicle in traffic	Inattention
50	3/6/2017	Monday	8:16	PDO	Angle	Dry	Daylight	Clear	Travelling straight ahead	Entering traffic lane	Collision with motor vehicle in traffic	Failed to yield right of way
51	4/27/2017	Thursday	17:16	PDO	Angle	Dry	Daylight	Clear	Travelling straight ahead	Turning left	Collision with motor vehicle in traffic	Inattention
52	5/13/2017	Saturday	22:24	PDO	Sideswipe,same direction	Wet	Dark - lighted roadway	Rain	Travelling straight ahead	Travelling straight ahead	Collision with motor vehicle in traffic	Inattention
53	5/16/2017	Tuesday	19:10	Non-fatal-injury	Angle	Dry	Dusk	Clear	Turning left		Collision with cyclist	No improper driving
54	6/18/2017	Sunday	14:41	Non-fatal-injury	Angle	Dry	Daylight	Cloudy	Entering traffic lane	Travelling straight ahead	Collision with motor vehicle in traffic	Failed to yield right of way
55	7/27/2017	Thursday	18:25	PDO	Angle	Wet	Daylight	Cloudy	Entering traffic lane	Travelling straight ahead	Collision with motor vehicle in traffic	Inattention
56	7/27/2017	Thursday	20:53	PDO	Angle	Dry	Dark - lighted roadway	Clear	Turning left	Travelling straight ahead	Collision with motor vehicle in traffic	Made an improper turn
57	7/27/2017	Thursday	21:02	PDO	Rear-end	Dry	Dark - lighted roadway	Clear	Slowing or stopped	Travelling straight ahead	Collision with motor vehicle in traffic	Other improper action

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58	9/1/2017	Friday	15:47	PDO	Sideswipe,same direction	Dry	Daylight	Clear	Entering traffic lane	Entering traffic lane	Collision with motor vehicle in traffic	Unknown
59	9/7/2017	Thursday	17:29	PDO	Angle	Dry	Daylight	Clear	Travelling straight ahead	Travelling straight ahead	Collision with motor vehicle in traffic	Inattention
60	10/18/2017	Wednesday	18:03	PDO	Rear-end	Wet	Dusk	Clear	Travelling straight ahead	Entering traffic lane	Collision with motor vehicle in traffic	Failed to yield right of way
61	10/20/2017	Friday	20:25	PDO	Angle	Dry	Dark - lighted roadway	Clear	Turning left	Travelling straight ahead	Collision with motor vehicle in traffic	Failed to yield right of way
62	11/3/2017	Friday	17:55	PDO	Rear-end	Dry	Dark - lighted roadway	Cloudy	Slowing or stopped	Travelling straight ahead	Collision with motor vehicle in traffic	No improper driving
63	11/9/2017	Thursday	9:35	PDO	Head on	Dry	Daylight	Clear	Turning left	Travelling straight ahead	Collision with motor vehicle in traffic	Unknown
64	11/18/2017	Saturday	14:40	PDO	Angle	Dry	Daylight	Cloudy	Entering traffic lane	Travelling straight ahead	Collision with motor vehicle in traffic	Failed to yield right of way
65	12/1/2017	Friday	10:31	PDO	Angle	Dry	Daylight	Clear	Travelling straight ahead	Turning left	Collision with motor vehicle in traffic	Failed to yield right of way
66	12/1/2017	Friday	17:35	PDO	Angle	Dry	Dark - lighted roadway	Clear	Turning left	Travelling straight ahead	Collision with motor vehicle in traffic	Unknown
67	12/12/2017	Tuesday	17:58	PDO	Angle	Wet	Dark - lighted roadway	Cloudy	Turning left	Travelling straight ahead	Collision with motor vehicle in traffic	Inattention
68	12/20/2017	Wednesday	17:28	Non-fatal-injury	Angle	Dry	Dark - lighted roadway	Clear	Entering traffic lane	Travelling straight ahead	Collision with motor vehicle in traffic	Failed to yield right of way
69	1/3/2018	Wednesday	18:02	PDO	Angle	Dry	Dark - lighted roadway	Clear	Entering traffic lane	Travelling straight ahead	Collision with motor vehicle in traffic	No improper driving
70	1/12/2018	Friday	15:11	PDO	Angle	Wet	Daylight	Rain	Travelling straight ahead	Turning right	Collision with motor vehicle in traffic	Inattention
71	2/3/2018	Saturday	12:32	PDO	Angle	Wet	Daylight	Clear	Travelling straight ahead	Turning left	Collision with motor vehicle in traffic	Failed to yield right of way
72	2/8/2018	Thursday	13:45	PDO	Angle	Dry	Daylight	Clear	Travelling straight ahead	Turning left	Collision with motor vehicle in traffic	Failed to yield right of way
73	4/4/2018	Wednesday	19:41	PDO	Angle	Wet	Dark - lighted roadway	Rain	Travelling straight ahead	Travelling straight ahead	Collision with motor vehicle in traffic	Followed too closely
74	4/6/2018	Friday	7:29	PDO	Head on	Dry	Daylight	Clear	Slowing or stopped	Travelling straight ahead	Collision with motor vehicle in traffic	Unknown
75	4/7/2018	Saturday	12:56	PDO	Sideswipe,same direction	Dry	Daylight	Clear	Travelling straight ahead	Entering traffic lane	Collision with motor vehicle in traffic	No improper driving
76	4/27/2018	Friday	13:10	PDO	Angle	Wet	Daylight	Rain	Travelling straight ahead	Turning left	Collision with motor vehicle in traffic	Failed to yield right of way
77	6/4/2018	Monday	12:21	Non-fatal-injury	Angle	Wet	Daylight	Rain	Travelling straight ahead	Turning left	Collision with motor vehicle in traffic	Failed to yield right of way
78	6/21/2018	Thursday	7:38	PDO	Angle	Dry	Daylight	Clear	Travelling straight ahead	Turning left	Collision with motor vehicle in traffic	Failed to yield right of way
79	7/27/2018	Friday	12:57	PDO	Angle	Dry	Daylight	Clear	Turning left	Travelling straight ahead	Collision with motor vehicle in traffic	Failed to yield right of way
80	8/8/2018	Wednesday	19:25	PDO	Angle	Wet	Dusk	Rain	Travelling straight ahead	Travelling straight ahead	Collision with motor vehicle in traffic	Unknown
81	8/27/2018	Monday	8:46	PDO	Angle	Dry	Daylight	Clear	Travelling straight ahead	Entering traffic lane	Collision with motor vehicle in traffic	Unknown
82	9/6/2018	Thursday	17:25	PDO	Angle	Wet	Daylight	Rain	Entering traffic lane	Overtaking/passing	Collision with motor vehicle in traffic	Failure to keep in proper lane or running off road
83	10/9/2018	Tuesday	17:11	PDO	Angle	Dry	Daylight	Clear	Travelling straight ahead	Overtaking/passing	Collision with motor vehicle in traffic	Disregarded traffic signs, signals, road markings
84	10/16/2018	Tuesday	12:32	PDO	Angle	Dry	Daylight	Clear	Travelling straight ahead	Entering traffic lane	Collision with motor vehicle in traffic	Failed to yield right of way
85	10/23/2018	Tuesday	18:31	PDO	Angle	Wet	Dark - lighted roadway	Rain	Travelling straight ahead	Travelling straight ahead	Collision with motor vehicle in traffic	Inattention
86	12/18/2018	Tuesday	6:07	PDO	Sideswipe,same direction	Ice	Dark - lighted roadway	Blowing Sand, sno	Travelling straight ahead		Collision with motor vehicle in traffic	No improper driving
87	12/19/2018	Wednesday	18:52	PDO	Angle	Dry	Dark - lighted roadway	Clear	Turning left	Slowing or stopped	Collision with motor vehicle in traffic	Made an improper turn
88	1/7/2019	Monday	18:38	Non-fatal-injury	Angle	Dry	Dark - lighted roadway	Clear	Travelling straight ahead	Turning left	Collision with motor vehicle in traffic	Failed to yield right of way
89	1/8/2019	Tuesday	16:55	PDO	Angle	Wet	Dark - lighted roadway	Rain	Turning left	Travelling straight ahead	Collision with motor vehicle in traffic	Disregarded traffic signs, signals, road markings
90	1/24/2019	Thursday	11:53	PDO	Angle	Wet	Daylight	Rain	Travelling straight ahead	Turning left	Collision with motor vehicle in traffic	Failed to yield right of way
91	2/13/2019	Wednesday	6:15	Non-fatal-injury	Angle	Slush	Dawn	Rain	Travelling straight ahead	Travelling straight ahead	Collision with motor vehicle in traffic	Unknown
92	3/12/2019	Tuesday	18:01	PDO	Rear-end	Dry	Daylight	Clear	Travelling straight ahead	Travelling straight ahead	Collision with motor vehicle in traffic	Inattention
93	3/28/2019	Thursday	18:07	PDO	Rear-end	Dry	Daylight	Clear	Travelling straight ahead	Slowing or stopped	Collision with motor vehicle in traffic	Followed too closely
94	4/3/2019	Wednesday	20:32	Non-fatal-injury	Angle	Wet	Dark - lighted roadway	Cloudy	Travelling straight ahead	Travelling straight ahead	Collision with motor vehicle in traffic	Inattention
95	4/14/2019	Sunday	12:20	PDO	Sideswipe,opposit direction	Dry	Daylight	Cloudy	Slowing or stopped	Turning right	Collision with motor vehicle in traffic	Made an improper turn
96	8/26/2019	Monday	17:13	PDO	Angle	Dry	Daylight	Clear	Travelling straight ahead	Turning left	Collision with motor vehicle in traffic	Made an improper turn
97	9/23/2019	Monday	12:49	Non-fatal-injury	Head on	Dry	Daylight	Clear	Travelling straight ahead	Turning left	Collision with motor vehicle in traffic	Failed to yield right of way
98	10/9/2019	Wednesday	12:22	PDO	Angle	Wet	Daylight	Rain	Travelling straight ahead	Turning left	Collision with motor vehicle in traffic	Made an improper turn

APPENDIX B

**Quincy Intersection Study Count Request
November 2019**

**Commonwealth of Massachusetts
DEPARTMENT OF TRANSPORTATION
Office of Transportation Planning**

MEMORANDUM

TO: Bonnie Polin, Manager Highway Safety Programs, Traffic Operations
THROUGH: David Mohler, Executive Director
FROM: Ethan Britland, Manager Multi-Modal Planning
DATE: November 7, 2019
RE: Traffic Count Request: Adams Street at Furnace Brook Parkway in Quincy

The Office of Transportation Planning requests that the Highway Division collect the following data in the vicinity of Adams Street at Furnace Brook Parkway in Quincy:

- Turning movement counts (TMC) at three locations
- Spot speed study/automatic traffic recorder (ATR) counts at four locations

Descriptions of the sites along with a map showing count locations are attached. These counts are needed for the Safety and Operations Analysis at Selected Intersections Study recently begun by Central Transportation Planning Staff (CTPS) on behalf of MassDOT through funding from the Boston Region Metropolitan Planning Organization. These data should be collected in November before the Thanksgiving week (November 24) holidays or December before the Christmas week (December 22).

The TMC should be performed for the following periods on a mid-week day (Tuesday, Wednesday, or Thursday) and a Saturday:

- Weekday AM peak period (6:00 AM to 10:00 AM)
- Weekday PM peak period (2:00 PM to 6:00 PM)
- Saturday midday peak period (10:00 AM to 2:00 PM)

Please record the TMC data for **passenger cars, trucks and buses, pedestrians, and bicycles** separately.

For the spot speed study/ATR counts, a consecutive five-day (Tuesday through Saturday) count should be completed for each location. When the job is complete, please provide us with data sets in 15-minute intervals (TMC) and hourly intervals (spot speed study/ATR counts). If you have questions about this request, please contact me at (857) 368-8840.

Attachments: 1. List of TMC and spot speed study/ATR locations
2. Count locations graphic

cc: J. Amato, MassDOT – Traffic Data Collection
M. Niles, MassDOT– OTP
S. Peterson, CTPS

M. Abbott, CTPS
C. Wang, CTPS

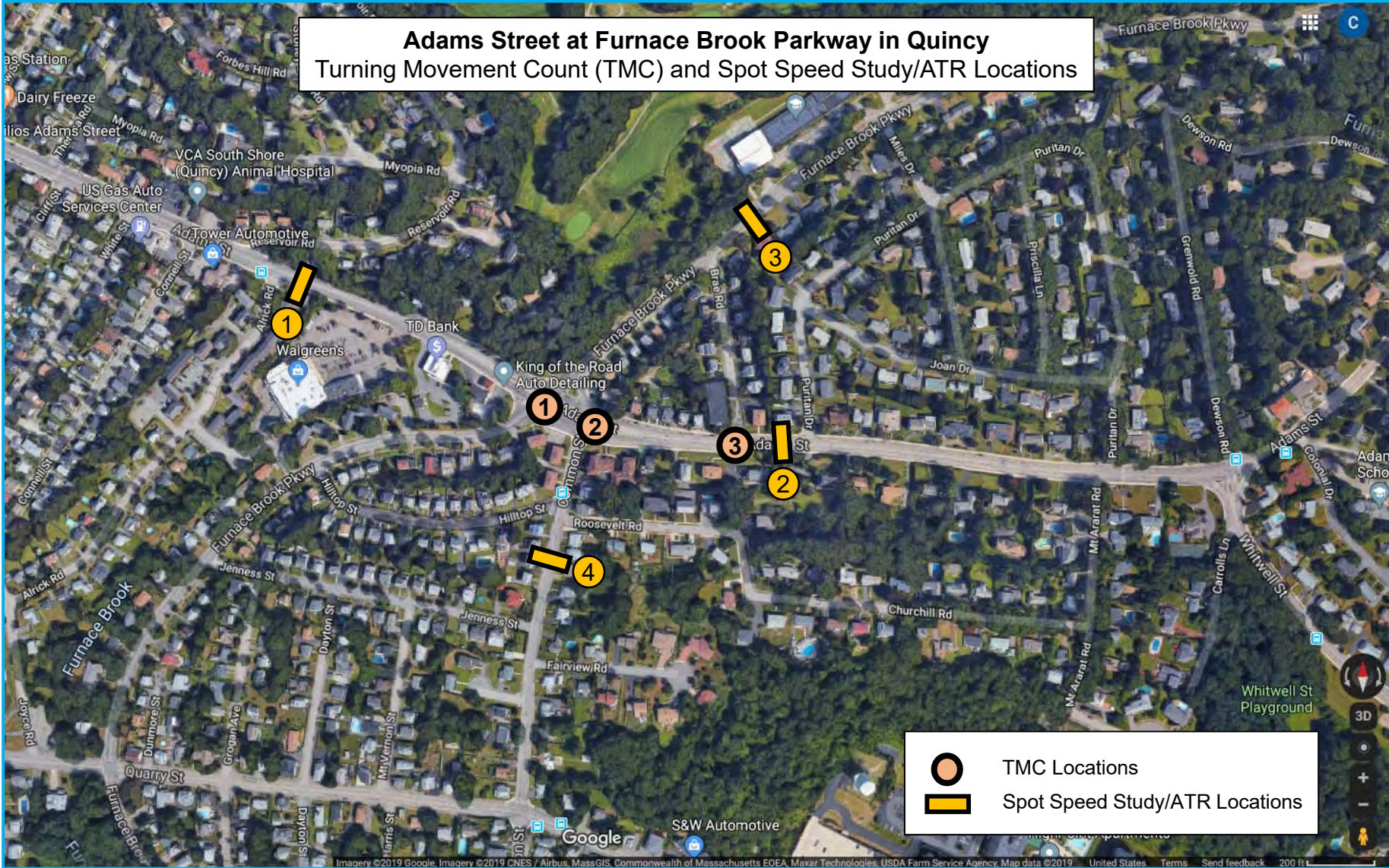
List of Turning Movement Counts (TMC) Needed, by Location



1. Adams Street at Furnace Brook Parkway
2. Adams Street at Common Street
3. Adams Street at Brae Road (including the driveway on the south side of Adams Street)

List of Spot Speed Study/ATR Counts Needed, by Location

1. Adams Street east of Alrick Road
2. Adams Street east of Brae Road
3. Furnace Brook Parkway north Brae Road (near Bernazzani Elementary School)
4. Common Street south of Roosevelt Road

Adams Street at Furnace Brook Parkway in Quincy Turning Movement Count (TMC) and Spot Speed Study/ATR Locations



 TMC Locations
 Spot Speed Study/ATR Locations

**Commonwealth of Massachusetts
DEPARTMENT OF TRANSPORTATION
Office of Transportation Planning**

MEMORANDUM

TO: Carrie McInerney, Manager of Advanced Transportation Technologies
THROUGH: David Mohler, Executive Director
FROM: Ethan Britland, Manager Multi-Modal Planning
DATE: September 11, 2020
RE: Traffic Count Request: Adams Street at Furnace Brook Parkway in Quincy

The Office of Transportation Planning requests that the Highway Division collect the following data in the vicinity of Adams Street at Furnace Brook Parkway in Quincy:

- Turning movement counts (TMC) at Adams Street and Furnace Brook Parkway
- TMC at Adams Street and Common Street

Descriptions of the sites with a map showing count locations is attached. These counts are needed for the Safety and Operations Analysis at Selected Intersections Study recently begun by Central Transportation Planning Staff (CTPS) on behalf of MassDOT through funding from the Boston Region Metropolitan Planning Organization. These data should be collected before October 11, 2020.

The TMC should be performed for the following periods on a mid-week day (Tuesday, Wednesday, or Thursday) and a Saturday:

- Weekday AM peak period (6:00 AM to 10:00 AM)
- Weekday PM peak period (2:00 PM to 6:00 PM)
- Saturday midday peak period (10:00 AM to 2:00 PM)

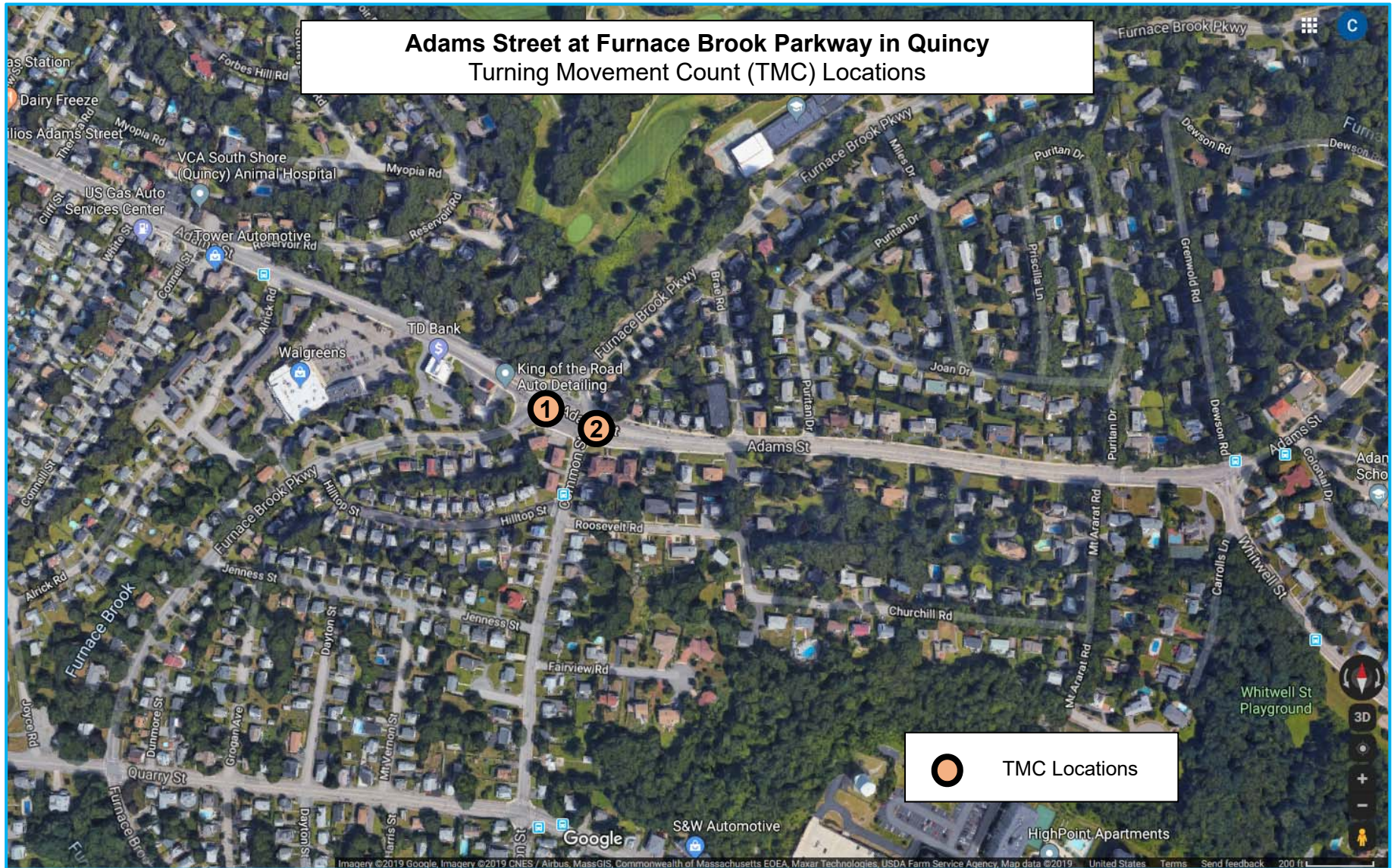
Please record the TMC data for **passenger cars, trucks and buses, pedestrians, and bicycles** separately.

If you have questions about this request, please contact me at (857) 368-8840.

Attachments: Count locations graphic

cc: J. Amato, MassDOT – Traffic Data Collection
M. Niles, MassDOT– OTP
S. Peterson, CTPS
M. Abbott, CTPS
C. Wang, CTPS

Adams Street at Furnace Brook Parkway in Quincy Turning Movement Count (TMC) Locations



APPENDIX C
Automatic Traffic Count Data
February 2020

Location ID	S20-005-243-01_EB	Located On	ADAMS STREET	Community	Quincy
Counted By		Between	ALRICK ROAD	County	Norfolk
Start Date	2/27/2020	And	FURNACE BROOK PARKWAY	Module	
Start Time	11:00:00 AM	Direction	EB	Agency	MHD
		Source		Owner ID	mhdds

FHWA-Scheme F Classification

Start Time	Motor cycle	Car	Light Truck	Bus	2A SU	3A SU	>3A SU	<5A 2U	5A 2U	>5A 2U	<6A >2U	6A >2U	>6A >2U	14	15	Total
12:00 AM	0	34	2	0	0	0	0	0	0	0	0	0	0	0	0	36
1:00 AM	0	19	2	0	1	0	0	0	0	0	0	0	0	0	0	22
2:00 AM	0	13	0	0	0	0	0	0	0	0	0	0	0	0	0	13
3:00 AM	0	15	3	0	0	0	0	0	0	0	0	0	0	0	0	18
4:00 AM	0	26	8	0	0	1	0	0	0	0	0	0	0	0	0	35
5:00 AM	0	68	8	0	0	0	0	0	0	0	0	0	0	0	0	76
6:00 AM	0	212	49	0	2	1	0	0	0	0	0	0	0	0	0	264
7:00 AM	0	469	52	0	1	2	0	1	0	0	0	0	0	0	0	525
8:00 AM	0	430	40	1	4	2	0	0	0	0	0	1	0	0	0	478
9:00 AM	1	377	50	1	4	1	0	1	0	0	0	0	0	0	0	435
10:00 AM	0	423	80	0	6	1	0	1	0	0	0	0	0	0	0	511
11:00 AM	3	367	40	0	6	1	0	0	0	0	0	0	0	0	0	417
12:00 PM	2	390	83	0	3	0	0	0	1	0	0	0	0	0	0	479
1:00 PM	1	421	69	1	5	0	0	2	1	0	0	0	0	0	0	500
2:00 PM	2	502	84	1	5	1	0	0	0	0	0	0	0	0	0	595
3:00 PM	3	555	80	0	6	0	0	1	0	0	0	0	0	0	0	645
4:00 PM	2	620	66	0	3	1	0	0	0	0	0	0	0	0	0	692
5:00 PM	2	699	68	2	0	0	0	0	0	0	0	0	0	0	0	771
6:00 PM	0	504	39	0	1	0	0	0	0	0	0	1	0	0	0	545
7:00 PM	0	303	34	0	1	0	0	0	0	0	0	0	0	0	0	338
8:00 PM	1	285	16	0	2	0	0	0	0	0	0	0	0	0	0	304
9:00 PM	0	184	14	0	0	0	0	0	0	0	0	0	0	0	0	198
10:00 PM	0	121	7	0	0	0	0	0	0	0	0	0	0	0	0	128
11:00 PM	0	66	9	0	0	0	0	0	0	0	0	0	0	0	0	75
TOTAL	17	7103	903	6	50	11	0	6	2	0	0	2	0	0	0	8100

Location ID	S20-005-243-01_WB	Located On	ADAMS STREET	Community	Quincy
Counted By		Between	ALRICK ROAD	County	Norfolk
Start Date	2/27/2020	And	S	Module	
Start Time	11:00:00 AM	Direction	WB	Agency	MHD
		Source		Owner ID	mhdds

FHWA-Scheme F Classification

Start Time	Motor cycle	Car	Light Truck	Bus	2A SU	3A SU	>3A SU	<5A 2U	5A 2U	>5A 2U	<6A >2U	6A >2U	>6A >2U	14	15	Total
12:00 AM	0	32	3	0	0	0	0	0	0	0	0	0	0	0	0	35
1:00 AM	0	17	0	0	1	0	0	0	0	0	0	0	0	0	0	18
2:00 AM	0	10	2	0	0	0	0	0	0	0	0	0	0	0	0	12
3:00 AM	0	11	3	0	1	0	0	0	0	0	0	0	0	0	0	15
4:00 AM	0	17	4	0	2	1	0	0	0	0	0	0	0	0	0	24
5:00 AM	0	129	27	0	2	0	0	0	0	0	0	0	0	0	0	158
6:00 AM	0	427	81	2	5	1	0	1	0	0	0	1	0	0	0	518
7:00 AM	1	713	103	2	6	1	0	0	1	0	2	1	0	0	0	830
8:00 AM	0	573	83	1	3	0	0	2	0	0	0	0	0	0	0	662
9:00 AM	0	390	67	1	8	1	0	0	0	0	0	1	0	0	0	468
10:00 AM	0	382	69	0	4	1	1	0	1	0	0	0	0	0	0	458
11:00 AM	0	370	53	0	6	3	0	0	0	0	0	0	0	0	0	432
12:00 PM	1	403	61	3	7	1	0	0	1	0	1	0	0	0	0	478
1:00 PM	0	381	57	1	4	0	0	1	0	0	0	4	0	0	0	448
2:00 PM	0	525	63	2	2	1	0	1	0	0	0	0	0	0	0	594
3:00 PM	0	440	72	1	5	0	0	0	0	0	0	0	0	0	0	518
4:00 PM	1	475	63	2	4	0	0	0	1	0	0	0	0	0	0	546
5:00 PM	0	550	56	0	6	0	0	2	0	0	1	0	0	0	0	615
6:00 PM	1	467	33	1	1	0	0	0	0	0	0	0	0	0	0	503
7:00 PM	0	333	38	0	0	0	0	0	0	0	0	0	0	0	0	371
8:00 PM	0	232	17	1	0	0	1	0	0	0	0	0	1	0	0	252
9:00 PM	0	168	13	0	0	0	0	0	0	0	0	0	0	0	0	181
10:00 PM	0	80	8	0	0	0	0	0	0	0	0	0	0	0	0	88
11:00 PM	0	35	6	0	1	0	0	0	0	0	0	0	0	0	0	42
TOTAL	4	7160	982	17	68	10	2	7	4	0	4	7	1	0	0	8266

Location ID	S20-005-243-02_EB	Located On	ADAMS STREET	Community	Quincy
Counted By		Between	COMMON STREET	County	Norfolk
Start Date	2/27/2020	And	BRAE ROAD	Module	
Start Time	11:00:00 AM	Direction	EB	Agency	MHD
		Source		Owner ID	mhdds

FHWA-Scheme F Classification

Start Time	Motor cycle	Car	Light Truck	Bus	2A SU	3A SU	>3A SU	<5A 2U	5A 2U	>5A 2U	<6A >2U	6A >2U	>6A >2U	14	15	Total
12:00 AM	0	23	1	0	0	0	0	0	0	0	0	0	0	0	0	24
1:00 AM	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	15
2:00 AM	0	6	1	0	1	0	0	0	0	0	0	0	0	0	0	8
3:00 AM	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	4
4:00 AM	0	20	2	0	0	0	0	0	0	0	0	0	0	0	0	22
5:00 AM	0	57	4	0	0	0	0	0	0	0	0	0	0	0	0	61
6:00 AM	0	131	20	0	1	1	0	1	0	0	0	0	0	0	0	154
7:00 AM	1	339	63	1	5	0	0	2	0	0	0	0	2	0	0	413
8:00 AM	0	302	48	1	9	3	0	0	0	0	0	0	0	0	0	363
9:00 AM	2	260	53	1	5	1	0	1	0	0	0	0	0	0	0	323
10:00 AM	0	245	36	0	6	0	0	1	0	0	0	0	0	0	0	288
11:00 AM	0	241	42	0	4	0	0	0	0	0	0	0	0	0	0	287
12:00 PM	2	235	51	0	7	2	0	2	0	0	0	0	0	0	0	299
1:00 PM	1	281	66	1	1	2	0	0	0	0	0	0	0	0	0	352
2:00 PM	1	286	71	1	4	3	0	1	0	0	0	0	1	0	0	368
3:00 PM	0	306	55	2	1	0	0	0	0	0	0	0	0	0	0	364
4:00 PM	0	386	69	1	2	1	0	1	0	0	0	0	0	0	0	460
5:00 PM	0	413	69	0	4	0	0	0	0	0	1	0	1	0	0	488
6:00 PM	2	326	38	0	3	0	0	1	1	0	1	0	0	0	0	372
7:00 PM	0	203	32	0	0	0	1	0	0	0	0	0	0	0	0	236
8:00 PM	1	185	20	1	0	0	0	0	0	0	0	0	0	0	0	207
9:00 PM	0	111	16	0	0	0	1	0	0	0	0	0	0	0	0	128
10:00 PM	0	76	12	0	0	0	0	0	0	0	0	0	0	0	0	88
11:00 PM	0	42	2	0	0	0	0	0	0	0	0	0	0	0	0	44
TOTAL	10	4493	771	9	53	13	2	10	1	0	2	2	2	0	0	5368

Location ID	S20-005-243-02_WB	Located On	ADAMS STREET	Community	Quincy
Counted By		Between	COMMON STREET	County	Norfolk
Start Date	2/27/2020	And	BRAE ROAD	Module	
Start Time	11:00:00 AM	Direction	WB	Agency	MHD
		Source		Owner ID	mhdds

FHWA-Scheme F Classification

Start Time	Motor cycle	Car	Light Truck	Bus	2A SU	3A SU	>3A SU	<5A 2U	5A 2U	>5A 2U	<6A >2U	6A >2U	>6A >2U	14	15	Total
12:00 AM	0	24	2	0	0	0	0	0	0	0	0	0	0	0	0	26
1:00 AM	0	12	1	0	0	0	0	0	0	0	0	0	0	0	0	13
2:00 AM	0	8	2	0	0	0	0	0	0	0	0	0	0	0	0	10
3:00 AM	0	9	2	0	0	0	0	0	0	0	0	0	0	0	0	11
4:00 AM	0	16	1	0	1	1	1	1	0	0	0	0	0	0	0	21
5:00 AM	0	80	9	0	1	0	0	0	0	0	0	0	0	0	0	90
6:00 AM	1	227	32	0	4	0	0	1	1	0	1	0	0	0	0	267
7:00 AM	2	397	39	2	6	1	0	1	0	0	1	1	0	0	0	450
8:00 AM	1	332	38	1	3	1	0	3	0	0	0	0	0	0	0	379
9:00 AM	0	235	34	1	4	1	1	1	0	0	0	0	1	0	0	278
10:00 AM	0	252	28	0	2	1	0	0	0	0	0	0	0	0	0	283
11:00 AM	1	269	23	1	1	3	0	0	0	0	0	0	0	0	0	298
12:00 PM	2	274	24	1	4	0	0	0	1	0	0	0	0	0	0	306
1:00 PM	0	280	34	0	2	0	2	1	0	0	0	0	0	0	0	319
2:00 PM	2	302	25	0	1	1	1	0	0	0	0	0	0	0	0	332
3:00 PM	0	280	30	0	3	0	1	0	0	0	0	0	0	0	0	314
4:00 PM	1	337	23	0	3	0	1	0	1	0	0	0	0	0	0	366
5:00 PM	0	366	26	0	2	0	1	0	0	0	0	0	0	0	0	395
6:00 PM	1	294	16	0	2	0	0	0	0	0	0	0	0	0	0	313
7:00 PM	0	213	12	0	0	0	0	0	0	0	0	0	0	0	0	225
8:00 PM	0	169	7	0	1	0	0	0	0	0	0	0	0	0	0	177
9:00 PM	0	127	5	0	0	0	0	0	0	0	0	0	0	0	0	132
10:00 PM	0	68	7	0	0	0	0	0	0	0	0	0	0	0	0	75
11:00 PM	0	33	4	0	0	0	0	0	0	0	0	0	0	0	0	37
TOTAL	11	4604	424	6	40	9	8	8	3	0	2	1	1	0	0	5117

Location ID	S20-005-243-03_NB	Located On	FURNACE BROOK PARKWAY	Community	Quincy
Counted By		Between	ADAMS STREET	County	Norfolk
Start Date	2/27/2020	And	BRAE ROAD	Module	
Start Time	10:00:00 AM	Direction	NB	Agency	MHD
		Source		Owner ID	mhdds

FHWA-Scheme F Classification

Start Time	Motor cycle	Car	Light Truck	Bus	2A SU	3A SU	>3A SU	<5A 2U	5A 2U	>5A 2U	<6A >2U	6A >2U	>6A >2U	14	15	Total
12:00 AM	0	31	3	0	0	0	0	0	0	0	0	0	0	0	0	34
1:00 AM	0	14	1	0	0	0	0	0	0	0	0	0	0	0	0	15
2:00 AM	1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	6
3:00 AM	0	7	2	0	0	0	0	0	0	0	0	0	0	0	0	9
4:00 AM	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	11
5:00 AM	0	50	7	0	0	0	0	0	0	0	0	0	0	0	0	57
6:00 AM	0	151	26	0	0	0	0	0	0	0	0	0	0	0	0	177
7:00 AM	3	400	35	1	1	0	1	3	0	0	1	0	0	0	0	445
8:00 AM	5	299	40	0	1	0	0	2	0	0	0	0	1	0	0	348
9:00 AM	2	288	47	0	4	0	0	2	1	0	0	0	0	0	0	344
10:00 AM	7	330	35	1	0	0	1	0	0	0	0	0	0	0	0	374
11:00 AM	0	231	31	0	2	0	0	0	0	0	0	0	0	0	0	264
12:00 PM	0	234	28	0	1	0	0	0	0	0	0	0	0	0	0	263
1:00 PM	1	282	40	0	1	0	0	0	0	0	0	1	0	0	0	325
2:00 PM	0	296	39	1	1	0	0	0	0	0	0	0	0	0	0	337
3:00 PM	0	337	53	0	0	0	0	0	0	0	0	0	0	0	0	390
4:00 PM	0	364	39	0	1	0	0	0	0	0	0	0	0	0	0	404
5:00 PM	0	412	34	0	0	0	0	0	0	0	0	0	0	0	0	446
6:00 PM	1	343	28	0	1	0	0	0	0	0	0	0	0	0	0	373
7:00 PM	0	224	19	0	0	0	0	0	0	0	0	0	0	0	0	243
8:00 PM	0	201	12	0	0	0	0	0	0	0	0	0	0	0	0	213
9:00 PM	0	129	9	0	0	0	0	0	0	0	0	0	0	0	0	138
10:00 PM	0	77	9	0	0	0	0	0	0	0	0	0	0	0	0	86
11:00 PM	0	48	3	1	0	0	0	0	0	0	0	0	0	0	0	52
TOTAL	20	4764	540	4	13	0	2	7	1	0	1	1	1	0	0	5354

Location ID	S20-005-243-03_SB	Located On	FURNACE BROOK PARKWAY	Community	Quincy
Counted By		Between	ADAMS STREET	County	Norfolk
Start Date	2/27/2020	And	BRAE ROAD	Module	
Start Time	10:00:00 AM	Direction	SB	Agency	MHD
		Source		Owner ID	mhdds

FHWA-Scheme F Classification

Start Time	Motor cycle	Car	Light Truck	Bus	2A SU	3A SU	>3A SU	<5A 2U	5A 2U	>5A 2U	<6A >2U	6A >2U	>6A >2U	14	15	Total
12:00 AM	0	26	3	0	0	0	0	0	0	0	0	0	0	0	0	29
1:00 AM	0	15	2	0	1	0	0	0	0	0	0	0	0	0	0	18
2:00 AM	0	8	1	0	0	0	0	0	0	0	0	0	0	0	0	9
3:00 AM	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	4
4:00 AM	0	15	3	0	0	0	0	0	0	0	0	0	0	0	0	18
5:00 AM	0	61	13	0	0	0	0	0	0	0	0	0	0	0	0	74
6:00 AM	0	188	29	0	2	0	0	0	0	0	0	0	0	0	0	219
7:00 AM	6	495	59	2	1	0	0	3	0	0	1	0	0	0	0	567
8:00 AM	1	381	34	1	1	0	2	0	0	0	0	0	0	0	0	420
9:00 AM	7	317	33	0	3	2	0	2	0	0	1	1	0	0	0	366
10:00 AM	7	326	45	0	2	0	0	3	0	0	0	0	0	0	0	383
11:00 AM	1	212	36	0	2	0	0	0	0	0	0	0	0	0	0	251
12:00 PM	1	263	37	0	1	1	0	0	0	0	0	0	0	0	0	303
1:00 PM	2	272	50	0	4	0	0	0	0	0	0	0	0	0	0	328
2:00 PM	0	378	58	1	1	0	0	0	2	0	0	0	0	0	0	440
3:00 PM	1	346	49	0	1	0	0	2	0	0	0	0	0	0	0	399
4:00 PM	2	452	49	0	2	0	0	2	0	0	0	1	0	0	0	508
5:00 PM	3	507	38	0	2	0	0	2	0	0	0	0	0	0	0	552
6:00 PM	0	328	26	0	1	0	0	0	0	0	0	0	0	0	0	355
7:00 PM	0	222	22	0	0	0	0	0	0	0	0	0	0	0	0	244
8:00 PM	0	163	12	0	0	0	0	0	0	0	0	0	0	0	0	175
9:00 PM	0	129	2	0	0	0	0	0	0	0	0	0	0	0	0	131
10:00 PM	0	67	6	0	0	0	0	0	0	0	0	0	0	0	0	73
11:00 PM	1	43	4	1	0	0	0	0	0	0	0	0	0	0	0	49
TOTAL	32	5217	612	5	24	3	2	14	2	0	2	2	0	0	0	5915

Location ID	S20-005-243-04_NB	Located On	COMMON STREET	Community	Quincy
Counted By		Between	ROOSEVELT ROAD	County	Norfolk
Start Date	2/27/2020	And	JENNESS STREET	Module	
Start Time	11:00:00 AM	Direction	NB	Agency	MHD
		Source		Owner ID	mhdds

FHWA-Scheme F Classification

Start Time	Motor cycle	Car	Light Truck	Bus	2A SU	3A SU	>3A SU	<5A 2U	5A 2U	>5A 2U	<6A >2U	6A >2U	>6A >2U	14	15	Total
12:00 AM	0	16	3	0	0	0	0	0	0	0	0	0	0	0	0	19
1:00 AM	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	6
2:00 AM	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	3
3:00 AM	0	8	1	0	0	0	0	0	0	0	0	0	0	0	0	9
4:00 AM	0	12	2	0	1	0	0	0	0	0	0	0	0	0	0	15
5:00 AM	0	52	12	0	1	0	0	0	0	0	0	0	0	0	0	65
6:00 AM	0	148	16	1	4	1	0	0	0	0	0	0	0	0	0	170
7:00 AM	1	283	26	1	4	0	1	3	1	0	0	0	0	0	0	320
8:00 AM	0	248	21	4	2	1	0	8	0	0	0	0	0	0	0	284
9:00 AM	0	132	29	0	4	2	0	2	0	0	0	1	0	0	0	170
10:00 AM	1	129	22	1	4	2	0	2	0	0	1	0	0	0	0	162
11:00 AM	0	111	19	0	6	0	0	0	0	0	0	0	0	0	0	136
12:00 PM	0	105	24	0	5	0	0	1	0	0	0	0	0	0	0	135
1:00 PM	0	157	16	1	4	0	0	0	0	0	0	0	0	0	0	178
2:00 PM	2	173	36	1	2	1	0	1	0	0	0	0	0	0	0	216
3:00 PM	0	154	30	2	3	0	0	1	0	0	0	0	0	0	0	190
4:00 PM	0	172	41	3	3	0	0	1	0	0	0	0	0	0	0	220
5:00 PM	0	235	20	2	2	0	0	2	0	0	0	0	0	0	0	261
6:00 PM	0	152	23	3	1	0	0	0	0	0	0	0	0	0	0	179
7:00 PM	0	106	27	1	3	0	0	0	0	0	0	0	0	0	0	137
8:00 PM	0	82	17	1	1	0	0	0	0	0	0	0	0	0	0	101
9:00 PM	0	59	11	0	1	0	0	0	0	0	0	0	0	0	0	71
10:00 PM	0	24	10	0	1	0	0	0	0	0	0	0	0	0	0	35
11:00 PM	0	21	14	0	3	0	0	0	0	0	0	0	0	0	0	38
TOTAL	4	2584	424	21	55	7	1	21	1	0	1	1	0	0	0	3120

Location ID	S20-005-243-04_SB	Located On	COMMON STREET	Community	Quincy
Counted By		Between	ROOSEVELT ROAD	County	Norfolk
Start Date	2/27/2020	And	JENNESS STREET	Module	
Start Time	11:00:00 AM	Direction	SB	Agency	MHD
		Source		Owner ID	mhdds

FHWA-Scheme F Classification

Start Time	Motor cycle	Car	Light Truck	Bus	2A SU	3A SU	>3A SU	<5A 2U	5A 2U	>5A 2U	<6A >2U	6A >2U	>6A >2U	14	15	Total
12:00 AM	0	10	2	0	0	0	0	0	0	0	0	0	0	0	0	12
1:00 AM	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	7
2:00 AM	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	3
3:00 AM	0	6	1	0	0	0	0	0	0	0	0	0	0	0	0	7
4:00 AM	0	5	3	0	0	0	0	0	0	0	0	0	0	0	0	8
5:00 AM	0	29	3	0	0	0	0	0	0	0	0	0	0	0	0	32
6:00 AM	0	71	14	0	2	0	0	0	0	0	0	0	0	0	0	87
7:00 AM	0	158	20	2	2	1	0	1	0	0	0	0	0	0	0	184
8:00 AM	0	145	20	1	6	1	0	0	0	0	0	0	0	0	0	173
9:00 AM	0	107	23	0	3	3	0	1	0	0	0	0	0	0	0	137
10:00 AM	0	135	28	1	3	1	0	0	0	0	0	0	0	0	0	168
11:00 AM	0	104	20	1	4	1	0	0	0	0	0	0	0	0	0	130
12:00 PM	1	111	24	1	2	0	0	0	0	0	0	0	0	0	0	139
1:00 PM	0	117	25	1	2	0	0	0	0	0	0	0	0	0	0	145
2:00 PM	1	180	42	1	1	2	0	0	0	0	0	0	0	0	0	227
3:00 PM	0	215	52	0	1	0	0	0	0	0	0	0	0	0	0	268
4:00 PM	0	256	55	2	5	0	0	1	1	0	0	0	0	0	0	320
5:00 PM	0	296	43	6	4	0	0	1	0	0	0	0	0	0	0	350
6:00 PM	0	196	21	1	3	0	0	0	0	0	0	0	0	0	0	221
7:00 PM	0	122	19	1	0	0	0	0	0	0	0	0	0	0	0	142
8:00 PM	0	103	6	1	1	0	0	0	0	0	0	0	0	0	0	111
9:00 PM	0	67	3	0	0	0	0	0	0	0	0	0	0	0	0	70
10:00 PM	0	38	5	0	0	0	0	0	0	0	0	0	0	0	0	43
11:00 PM	0	37	7	0	1	0	0	0	0	0	0	0	0	0	0	45
TOTAL	2	2518	436	19	40	9	0	4	1	0	0	0	0	0	0	3029

APPENDIX D
MassDOT Weekday Seasonal and Axle Correction Factors
2016–19

Massachusetts Highway Department
Statewide Traffic Data Collection
2016 Weekday Seasonal Factors

Factor Group	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Axle Factor
R1	1.21	1.17	1.10	1.04	0.97	0.92	0.90	0.88	0.97	0.93	0.97	1.05	0.88
R2	0.95	0.96	0.98	0.97	0.97	0.93	0.97	0.94	0.96	0.90	0.92	0.93	0.96
R3	1.15	1.03	1.02	0.99	0.92	0.91	0.91	0.90	0.94	0.93	0.99	1.02	0.97
R4-R7	1.09	1.13	1.06	1.05	0.95	0.90	0.88	0.91	0.95	0.95	1.04	1.07	0.95
U1-Boston	1.03	1.04	0.99	0.96	0.94	0.91	0.93	0.91	0.95	0.93	0.98	0.98	0.93
U1-Essex	1.06	1.08	1.04	1.01	0.95	0.89	0.88	0.86	0.94	0.94	1.01	1.05	0.91
U1-Southeast	1.07	1.12	1.05	1.01	0.95	0.89	0.87	0.86	0.94	0.95	0.99	1.01	0.94
U1-West	0.97	0.97	0.91	0.95	0.92	0.90	0.94	0.92	0.92	0.90	0.93	0.94	0.94
U1-Worcester	1.10	1.14	1.03	1.00	0.94	0.91	0.92	0.90	0.94	0.93	0.97	1.04	0.92
U2	1.02	1.00	0.97	0.96	0.93	0.90	0.93	0.91	0.94	0.93	0.96	0.99	0.95
U3	1.00	1.00	0.96	0.95	0.92	0.89	0.94	0.92	0.94	0.93	0.96	0.97	0.96
U4-U7	1.02	1.03	0.97	0.96	0.92	0.89	0.93	0.92	0.94	0.95	0.98	0.96	0.93
Rec - East	1.18	1.17	1.13	1.05	0.93	0.84	0.79	0.80	0.93	1.00	1.09	1.13	0.99
Rec - West	1.20	1.24	1.29	1.18	1.03	0.85	0.70	0.81	0.92	0.95	1.11	1.15	0.98

Round off:

0-999 = 10

>1000 = 100

U = Urban

R = Rural

1 - Interstate

2 - Freeway and Expressway

3 - Other Principal Arterial

4 - Minor Arterial

5 - Major Collector

6 - Minor Collector

7 - Local Road and Street

Recreational - East Group - Cape Cod (all towns) including the town of Plymouth south of Route 3A (stations 7014,7079,7080,7090,7091,7092,7093,7094,7095,7096,7097,7108 and 7178), Martha's Vineyard and Nantucket.

Recreational - West Group - Continuous Stations 2 and 189 including stations 1066,1067,1083,1084,1085,1086,1087,1088,1089,1090,1091,1092,1093,1094,1095,1096,1097,1098,1099,1100,1101,1102,1103,1104,1105,1106,1107,1108,1113,1114,1116,2196,2197 and 2198.

Massachusetts Highway Department
Statewide Traffic Data Collection
2017 Weekday Seasonal Factors

Factor Group	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Axle Factor
R1	1.30	1.23	1.21	1.04	0.98	0.92	0.86	0.81	0.95	0.99	1.03	1.10	0.80
R2	0.95	0.96	0.98	0.97	0.97	0.93	0.97	0.94	0.96	0.90	0.92	0.93	0.96
R3	1.05	1.01	1.04	0.99	0.94	0.93	0.91	0.92	0.96	0.94	1.01	1.03	0.97
R4-R7	1.10	1.07	1.09	1.00	0.95	0.89	0.88	0.87	0.92	0.95	1.04	1.09	0.93
U1-Boston	1.01	1.04	0.99	0.94	0.93	0.92	0.96	0.93	0.94	0.93	0.95	0.98	0.95
U1-Essex	1.04	1.05	1.00	0.96	0.93	0.89	0.90	0.90	0.93	0.93	0.98	1.03	0.90
U1-Southeast	1.07	1.05	1.02	0.97	0.95	0.90	0.89	0.88	0.92	0.94	0.98	1.01	0.97
U1-West	1.00	0.96	0.94	0.92	0.93	0.92	0.95	0.93	0.92	0.92	0.97	0.97	0.89
U1-Worcester	1.10	1.10	1.04	0.97	0.95	0.94	0.93	0.91	0.95	0.96	0.98	1.04	0.89
U2	1.01	1.03	0.98	0.95	0.93	0.91	0.94	0.92	0.95	0.95	0.95	0.97	0.98
U3	1.03	1.05	1.01	0.95	0.92	0.90	0.94	0.93	0.93	0.92	0.96	0.99	0.96
U4-U7	1.06	1.05	1.02	0.96	0.92	0.89	0.95	0.95	0.92	0.92	0.98	1.03	0.98
Rec - East	1.18	1.17	1.08	1.03	0.95	0.87	0.83	0.83	0.97	0.98	1.19	1.19	0.98
Rec - West	1.30	1.23	1.32	1.18	0.95	0.82	0.70	0.69	0.97	0.96	1.16	1.15	0.95

Round off:

0-999 = 10

>1000 = 100

U = Urban

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1 - Interstate

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Recreational - East Group - Cape Cod (all towns) including the town of Plymouth south of Route 3A (stations 7014,7079,7080,7090,7091,7092,7093,7094,7095,7096,7097,7108 and 7178), Martha's Vineyard and Nantucket.

Recreational - West Group - Continuous Stations 2 and 189 including stations 1066,1067,1083,1084,1085,1086,1087,1088,1089,1090,1091,1092,1093,1094,1095,1096,1097,1098,1099,1100,1101,1102,1103,1104,1105,1106,1107,1108,1113,1114,1116,2196,2197 and 2198.

Massachusetts Highway Department
 Statewide Traffic Data Collection
 2018 Weekday Seasonal Factors

Factor Group	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Axle Factor
R1	1.37	1.26	1.30	1.08	0.97	0.93	0.87	0.83	0.96	0.98	1.05	1.13	0.78
R2	0.95	0.96	0.98	0.97	0.97	0.93	0.97	0.94	0.96	0.90	0.92	0.93	0.96
R3	1.15	1.06	1.07	1.00	0.89	0.88	0.89	0.89	0.95	0.92	1.02	1.01	0.98
R4-R7	1.10	1.07	1.03	1.00	0.90	0.92	0.94	0.94	0.96	0.94	1.03	1.02	0.93
U1-Boston	1.05	0.98	1.01	0.93	0.92	0.91	0.95	0.93	0.94	0.92	0.96	0.99	0.96
U1-Essex	1.05	1.01	1.04	0.93	0.92	0.89	0.90	0.90	0.94	0.93	0.98	1.01	0.91
U1-Southeast	1.11	1.05	1.07	0.99	0.93	0.89	0.88	0.87	0.93	0.95	1.01	1.05	0.98
U1-West	1.15	1.08	1.07	0.98	0.94	0.92	0.92	0.88	0.92	0.91	1.00	1.06	0.83
U1-Worcester	1.18	1.11	1.09	0.99	0.95	0.94	0.95	0.91	0.97	0.97	1.01	1.05	0.87
U2	1.04	0.99	0.99	0.94	0.92	0.90	0.93	0.91	0.94	0.92	0.96	0.98	0.99
U3	0.99	1.00	1.02	0.96	0.91	0.89	0.92	0.90	0.95	0.92	1.01	0.97	0.97
U4-U7	1.03	1.02	0.97	0.95	0.88	0.89	0.96	0.93	0.94	0.93	1.00	1.00	0.99
Rec - East	1.22	1.15	1.09	1.12	0.90	0.89	0.82	0.83	0.92	0.98	1.06	1.08	0.99
Rec - West	1.30	1.23	1.32	1.18	0.95	0.82	0.70	0.69	0.97	0.96	1.16	1.15	0.97

Round off:

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Massachusetts Highway Department
Statewide Traffic Data Collection
2019 Weekday Seasonal Factors

Factor Group	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Axle Factor
R1	1.22	1.14	1.12	1.06	1.00	0.96	0.87	0.85	0.96	0.99	1.04	1.12	0.85
R2	0.95	0.96	0.98	0.97	0.97	0.93	0.97	0.94	0.96	0.90	0.92	0.93	0.96
R3	1.15	1.06	1.07	1.00	0.89	0.88	0.89	0.89	0.95	0.92	1.02	1.01	0.97
R4-R7	1.09	1.09	1.11	1.02	0.96	0.92	0.89	0.89	0.99	0.98	1.09	1.13	0.98
U1-Boston	1.03	1.01	0.98	0.94	0.94	0.92	0.95	0.93	0.94	0.94	0.97	1.04	0.96
U1-Essex	1.09	1.06	1.03	0.99	0.94	0.90	0.88	0.86	0.93	0.94	0.99	1.06	0.93
U1-Southeast	1.06	1.05	1.01	0.97	0.95	0.93	0.93	0.90	0.94	0.94	0.98	1.04	0.98
U1-West	1.19	1.14	1.09	0.95	0.92	0.89	0.89	0.86	0.91	0.95	0.97	1.07	0.84
U1-Worcester	1.02	1.04	0.97	0.94	0.93	0.91	0.95	0.91	0.93	0.92	0.95	1.10	0.88
U2	1.01	1.00	0.94	0.93	0.91	0.89	0.93	0.90	0.90	0.91	0.94	1.02	0.99
U3	1.06	1.03	0.98	0.94	0.93	0.91	0.95	0.91	0.92	0.93	0.97	1.00	0.98
U4-U7	1.01	1.00	0.95	0.92	0.88	0.86	0.92	0.91	0.92	0.94	0.99	1.04	0.99
Rec - East	1.04	1.16	1.12	0.98	0.92	0.88	0.77	0.81	0.94	1.02	1.08	1.12	0.99
Rec - West	1.30	1.23	1.32	1.18	0.95	0.82	0.70	0.69	0.97	0.96	1.16	1.15	0.98

Round off:

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Recreational - West Group - Continuous Stations 2 and 189 including stations 1066,1067,1083,1084,1085,1086,1087,1088,1089,1090,1091,1092,1093,1094,1095,1096,1097,1098,1099,1100,1101,1102,1103,1104,1105,1106,1107,1108,1113,1114,1116,2196,2197 and 2198.

APPENDIX E
Turning Movement Count Data
Adams Street at Furnace Brook Parkway
October 2020

Leg Direction	Adams Street Eastbound						Adams Street Westbound						Furnace Brook Parkway Northbound						Furnace Brook Parkway Southbound						
Time	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	Int
% Bicycles on Road	0.2%	0.2%	0.4%	0%	0.3%	-	0.4%	0.1%	0%	0%	0.1%	-	0%	0.6%	0.1%	0%	0.4%	-	0.2%	0.4%	1.3%	0%	0.7%	-	0.4%
Pedestrians	-	-	-	-	-	74	-	-	-	-	-	46	-	-	-	-	-	76	-	-	-	-	-	-	65
% Pedestrians	-	-	-	-	-	-80.4%	-	-	-	-	-	-82.1%	-	-	-	-	-	-88.4%	-	-	-	-	-	-	-89.0%
Bicycles on Crosswalk	-	-	-	-	-	18	-	-	-	-	-	10	-	-	-	-	-	10	-	-	-	-	-	-	8
% Bicycles on Crosswalk	-	-	-	-	-	-19.6%	-	-	-	-	-	-17.9%	-	-	-	-	-	-11.6%	-	-	-	-	-	-	-11.0%

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

207487-A Furnace Brook Parkway @ Adams Stree... - TMC

Thu Oct 1, 2020

AM Peak (Oct 01 2020 7:30AM - 8:30 AM)

All Classes (Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

ID: 786554, Location: 42.253518, -71.025273

Provided by: Precision Data Industries, LLC (PDI)

46 Morton Street, Framingham, MA, MA, 01702, US

Leg Direction	Adams Street Eastbound						Adams Street Westbound						Furnace Brook Parkway Northbound						Furnace Brook Parkway Southbound						Int
	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	
2020-10-01 7:30AM	19	60	21	0	100	4	8	83	0	0	91	3	15	44	15	0	74	5	9	48	29	0	86	1	351
7:45AM	24	72	28	0	124	2	12	70	0	0	82	3	22	35	13	0	70	2	18	73	45	0	136	0	412
8:00AM	15	83	29	0	127	0	12	79	0	0	91	0	24	37	12	0	73	4	7	47	32	0	86	1	377
8:15AM	12	69	23	0	104	0	15	66	0	0	81	3	22	30	13	0	65	0	13	45	21	0	79	0	329
Total	70	284	101	0	455	6	47	298	0	0	345	9	83	146	53	0	282	11	47	213	127	0	387	2	1469
% Approach	15.4%	62.4%	22.2%	0%	-	-	13.6%	86.4%	0%	0%	-	-	29.4%	51.8%	18.8%	0%	-	-	12.1%	55.0%	32.8%	0%	-	-	-
% Total	4.8%	19.3%	6.9%	0%	31.0%	-	3.2%	20.3%	0%	0%	23.5%	-	5.7%	9.9%	3.6%	0%	19.2%	-	3.2%	14.5%	8.6%	0%	26.3%	-	-
PHF	0.729	0.855	0.871	-	0.896	-	0.783	0.898	-	-	0.948	-	0.865	0.830	0.883	-	0.953	-	0.653	0.723	0.700	-	0.706	-	0.890
Lights	69	275	100	0	444	-	47	285	0	0	332	-	82	143	49	0	274	-	47	210	121	0	378	-	1428
% Lights	98.6%	96.8%	99.0%	0%	97.6%	-	100%	95.6%	0%	0%	96.2%	-	98.8%	97.9%	92.5%	0%	97.2%	-	100%	98.6%	95.3%	0%	97.7%	-	97.2%
Single-Unit Trucks	1	5	0	0	6	-	0	9	0	0	9	-	0	2	3	0	5	-	0	0	4	0	4	-	24
% Single-Unit Trucks	1.4%	1.8%	0%	0%	1.3%	-	0%	3.0%	0%	0%	2.6%	-	0%	1.4%	5.7%	0%	1.8%	-	0%	0%	3.1%	0%	1.0%	-	1.6%
Articulated Trucks	0	1	0	0	1	-	0	2	0	0	2	-	0	1	0	0	1	-	0	1	0	0	1	-	5
% Articulated Trucks	0%	0.4%	0%	0%	0.2%	-	0%	0.7%	0%	0%	0.6%	-	0%	0.7%	0%	0%	0.4%	-	0%	0.5%	0%	0%	0.3%	-	0.3%
Buses	0	3	1	0	4	-	0	2	0	0	2	-	1	0	1	0	2	-	0	0	1	0	1	-	9
% Buses	0%	1.1%	1.0%	0%	0.9%	-	0%	0.7%	0%	0%	0.6%	-	1.2%	0%	1.9%	0%	0.7%	-	0%	0%	0.8%	0%	0.3%	-	0.6%
Bicycles on Road	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	2	1	0	3	-	3
% Bicycles on Road	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0.9%	0.8%	0%	0.8%	-	0.2%
Pedestrians	-	-	-	-	-	6	-	-	-	-	-	8	-	-	-	-	-	10	-	-	-	-	-	1	-
% Pedestrians	-	-	-	-	-	100%	-	-	-	-	-	88.9%	-	-	-	-	-	90.9%	-	-	-	-	-	50.0%	-
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	1	-
% Bicycles on Crosswalk	-	-	-	-	-	0%	-	-	-	-	-	11.1%	-	-	-	-	-	9.1%	-	-	-	-	-	50.0%	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

207487-A Furnace Brook Parkway @ Adams Street - TMC

Thu Oct 1, 2020

AM Peak (Oct 01 2020 7:30AM - 8:30 AM)

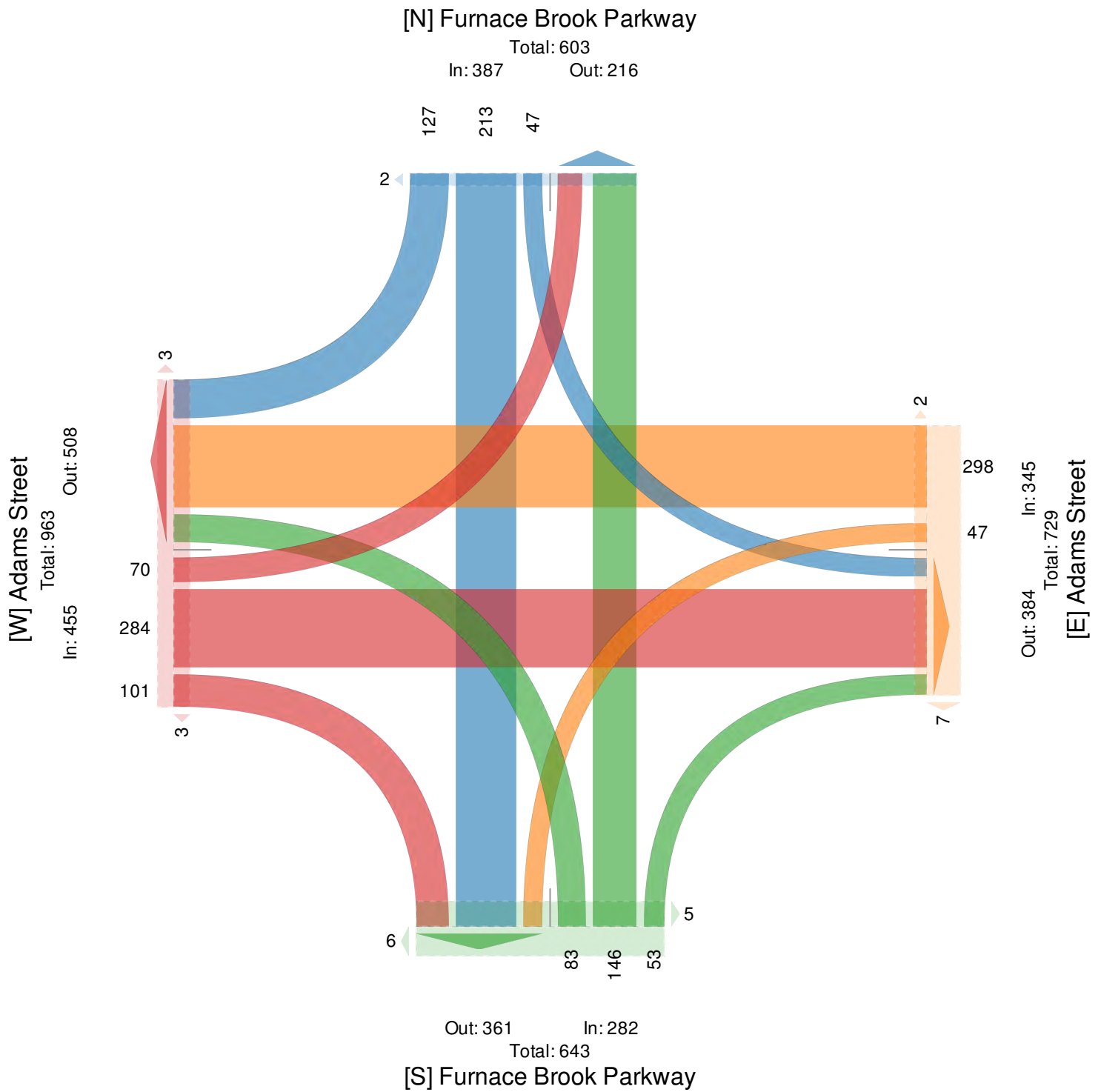
All Classes (Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

ID: 786554, Location: 42.253518, -71.025273



Provided by: Precision Data Industries, LLC (PDI)
46 Morton Street, Framingham, MA, MA, 01702, US



207487-A Furnace Brook Parkway @ Adams Stree... - TMC

Thu Oct 1, 2020

PM Peak (Oct 01 2020 4:45PM - 5:45 PM) - Overall Peak Hour

All Classes (Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

ID: 786554, Location: 42.253518, -71.025273

Provided by: Precision Data Industries, LLC
(PDI)
46 Morton Street,
Framingham, MA, MA, 01702, US

Leg Direction	Adams Street Eastbound						Adams Street Westbound						Furnace Brook Parkway Northbound						Furnace Brook Parkway Southbound						Int
	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	
2020-10-01 4:45PM	31	128	26	0	185	5	10	81	0	0	91	4	27	57	21	0	105	1	15	62	23	0	100	8	481
5:00PM	37	101	21	0	159	0	9	100	0	0	109	3	33	56	20	0	109	5	13	58	31	0	102	5	479
5:15PM	30	99	31	0	160	9	2	73	0	0	75	5	28	66	17	0	111	9	16	66	32	0	114	6	460
5:30PM	26	119	24	2	171	9	7	97	0	0	104	2	43	52	22	0	117	2	11	57	28	0	96	8	488
Total	124	447	102	2	675	23	28	351	0	0	379	14	131	231	80	0	442	17	55	243	114	0	412	27	1908
% Approach	18.4%	66.2%	15.1%	0.3%	-	-	7.4%	92.6%	0%	0%	-	-	29.6%	52.3%	18.1%	0%	-	-	13.3%	59.0%	27.7%	0%	-	-	-
% Total	6.5%	23.4%	5.3%	0.1%	35.4%	-	1.5%	18.4%	0%	0%	19.9%	-	6.9%	12.1%	4.2%	0%	23.2%	-	2.9%	12.7%	6.0%	0%	21.6%	-	-
PHF	0.838	0.871	0.833	0.250	0.908	-	0.700	0.878	-	-	0.869	-	0.762	0.875	0.909	-	0.944	-	0.859	0.920	0.917	-	0.911	-	0.978
Lights	122	443	99	2	666	-	28	345	0	0	373	-	131	230	78	0	439	-	54	243	110	0	407	-	1885
% Lights	98.4%	99.1%	97.1%	100%	98.7%	-	100%	98.3%	0%	0%	98.4%	-	100%	99.6%	97.5%	0%	99.3%	-	98.2%	100%	96.5%	0%	98.8%	-	98.8%
Single-Unit Trucks	2	2	1	0	5	-	0	5	0	0	5	-	0	1	2	0	3	-	1	0	0	0	1	-	14
% Single-Unit Trucks	1.6%	0.4%	1.0%	0%	0.7%	-	0%	1.4%	0%	0%	1.3%	-	0%	0.4%	2.5%	0%	0.7%	-	1.8%	0%	0%	0%	0.2%	-	0.7%
Articulated Trucks	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0
% Articulated Trucks	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%
Buses	0	1	0	0	1	-	0	1	0	0	1	-	0	0	0	0	0	-	0	0	0	0	0	-	2
% Buses	0%	0.2%	0%	0%	0.1%	-	0%	0.3%	0%	0%	0.3%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0.1%
Bicycles on Road	0	1	2	0	3	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	4	0	4	-	7
% Bicycles on Road	0%	0.2%	2.0%	0%	0.4%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	3.5%	0%	1.0%	-	0.4%
Pedestrians	-	-	-	-	-	20	-	-	-	-	-	13	-	-	-	-	-	16	-	-	-	-	-	27	-
% Pedestrians	-	-	-	-	-	87.0%	-	-	-	-	-	92.9%	-	-	-	-	-	94.1%	-	-	-	-	-	100%	-
Bicycles on Crosswalk	-	-	-	-	-	3	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	0	-
% Bicycles on Crosswalk	-	-	-	-	-	13.0%	-	-	-	-	-	7.1%	-	-	-	-	-	5.9%	-	-	-	-	-	0%	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

207487-A Furnace Brook Parkway @ Adams Stree... - TMC

Thu Oct 1, 2020

PM Peak (Oct 01 2020 4:45PM - 5:45 PM) - Overall Peak Hour

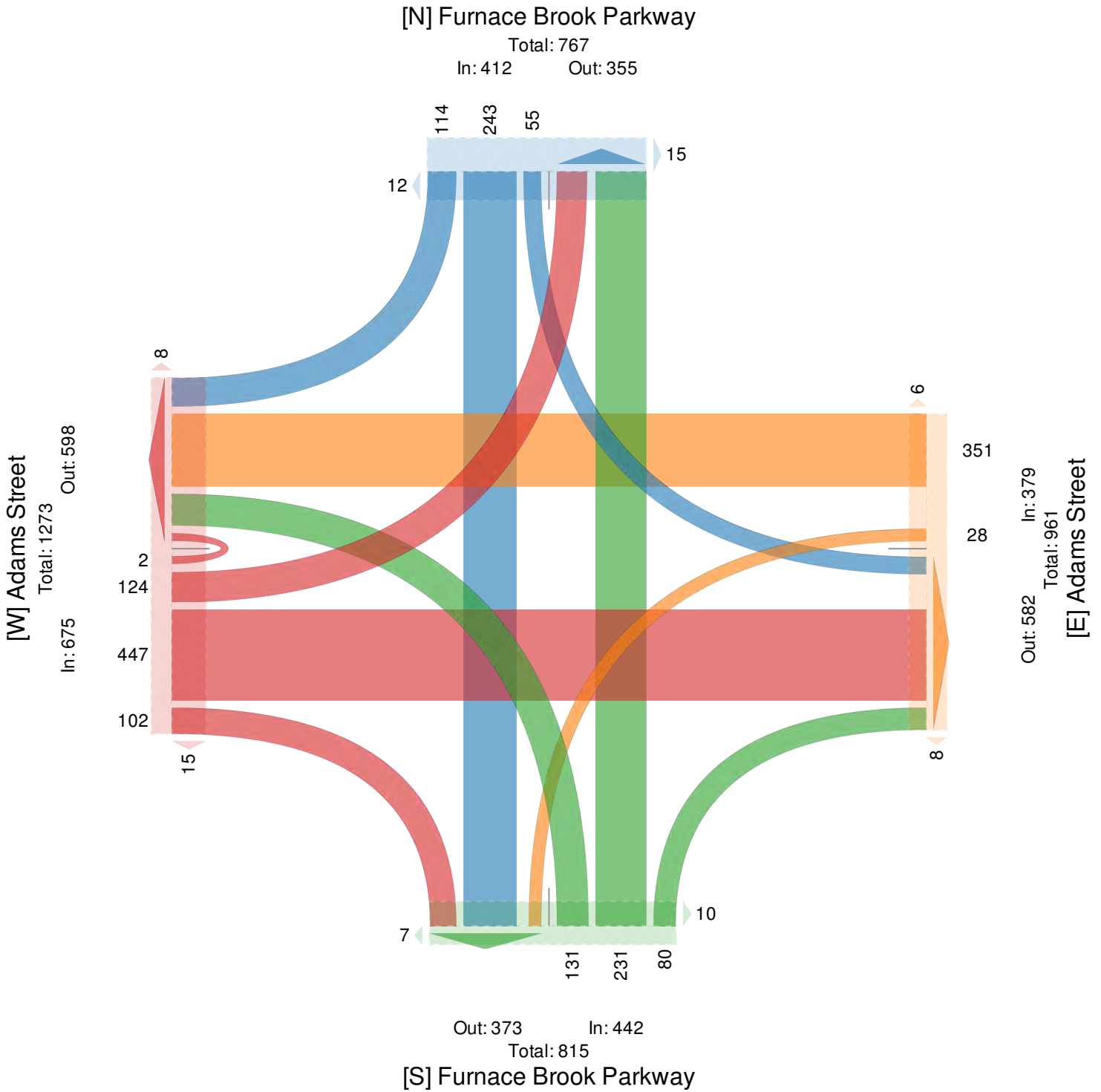
All Classes (Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

ID: 786554, Location: 42.253518, -71.025273



Provided by: Precision Data
Industries, LLC (PDI)
46 Morton Street,
Framingham, MA, MA, 01702, US



APPENDIX F

**Turning Movement Count Data
Adams Street at Common Street
October 2020**

Leg Direction	Adams Street Eastbound						Adams Street Westbound						Common Street Northbound						Furnace Brook Parkway Ramp Southbound						
Time	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	Int
% Buses	0%	0.3%	0.5%	0%	0.4%	-	0%	0.1%	0%	0%	0.1%	-	0.9%	0.3%	0%	0%	0.6%	-	0%	0%	0%	0%	0%	-	0.3%
Bicycles on Road	0	10	2	0	12	-	5	6	2	0	13	-	0	2	6	0	8	-	0	0	1	0	1	-	34
% Bicycles on Road	0%	0.3%	0.1%	0%	0.2%	-	1.5%	0.2%	2.6%	0%	0.4%	-	0%	0.3%	1.7%	0%	0.4%	-	0%	0%	100%	0%	50.0%	-	0.3%
Pedestrians	-	-	-	-	-	6	-	-	-	-	-	15	-	-	-	-	-	107	-	-	-	-	-	47	
% Pedestrians	-	-	-	-	-	100%	-	-	-	-	-	93.8%	-	-	-	-	-	92.2%	-	-	-	-	-	92.2%	-
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	1	-	-	-	-	-	9	-	-	-	-	-	4	
% Bicycles on Crosswalk	-	-	-	-	-	0%	-	-	-	-	-	6.3%	-	-	-	-	-	7.8%	-	-	-	-	-	7.8%	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

207487-B Adams Street @ Furnace Brook Parkwa... - TMC

Thu Oct 1, 2020

AM Peak (Oct 01 2020 7:30AM - 8:30 AM)

All Classes (Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

ID: 786555, Location: 42.253305, -71.024814

Provided by: Precision Data Industries, LLC
(PDI)
46 Morton Street,
Framingham, MA, MA, 01702, US

Leg Direction	Adams Street Eastbound						Adams Street Westbound						Common Street Northbound						Furnace Brook Parkway Ramp Southbound						Int
	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	
2020-10-01 7:30AM	1	59	26	0	86	0	6	67	5	0	78	0	23	12	17	0	52	4	0	0	0	0	0	0	216
7:45AM	2	58	39	0	99	1	8	55	2	1	66	0	27	10	6	0	43	3	0	0	0	0	0	1	208
8:00AM	0	70	35	0	105	0	12	73	1	0	86	0	18	11	13	0	42	6	0	0	0	0	0	0	233
8:15AM	0	57	39	0	96	0	9	57	0	0	66	1	24	6	7	0	37	2	0	0	0	0	0	0	199
Total	3	244	139	0	386	1	35	252	8	1	296	1	92	39	43	0	174	15	0	0	0	0	0	1	856
% Approach	0.8%	63.2%	36.0%	0%	-	-	11.8%	85.1%	2.7%	0.3%	-	-	52.9%	22.4%	24.7%	0%	-	-	0%	0%	0%	0%	-	-	-
% Total	0.4%	28.5%	16.2%	0%	45.1%	-	4.1%	29.4%	0.9%	0.1%	34.6%	-	10.7%	4.6%	5.0%	0%	20.3%	-	0%	0%	0%	0%	0%	-	-
PHF	0.375	0.868	0.891	-	0.917	-	0.729	0.863	0.400	0.250	0.860	-	0.852	0.792	0.574	-	0.813	-	-	-	-	-	-	-	0.928
Lights	3	234	135	0	372	-	35	243	8	1	287	-	89	37	35	0	161	-	0	0	0	0	0	-	820
% Lights	100%	95.9%	97.1%	0%	96.4%	-	100%	96.4%	100%	100%	97.0%	-	96.7%	94.9%	81.4%	0%	92.5%	-	0%	0%	0%	0%	-	-	95.8%
Single-Unit Trucks	0	5	3	0	8	-	0	7	0	0	7	-	1	1	2	0	4	-	0	0	0	0	0	-	19
% Single-Unit Trucks	0%	2.0%	2.2%	0%	2.1%	-	0%	2.8%	0%	0%	2.4%	-	1.1%	2.6%	4.7%	0%	2.3%	-	0%	0%	0%	0%	-	-	2.2%
Articulated Trucks	0	1	0	0	1	-	0	1	0	0	1	-	1	0	2	0	3	-	0	0	0	0	0	-	5
% Articulated Trucks	0%	0.4%	0%	0%	0.3%	-	0%	0.4%	0%	0%	0.3%	-	1.1%	0%	4.7%	0%	1.7%	-	0%	0%	0%	0%	-	-	0.6%
Buses	0	3	1	0	4	-	0	1	0	0	1	-	1	0	0	0	1	-	0	0	0	0	0	-	6
% Buses	0%	1.2%	0.7%	0%	1.0%	-	0%	0.4%	0%	0%	0.3%	-	1.1%	0%	0%	0%	0.6%	-	0%	0%	0%	0%	-	-	0.7%
Bicycles on Road	0	1	0	0	1	-	0	0	0	0	0	-	0	1	4	0	5	-	0	0	0	0	0	-	6
% Bicycles on Road	0%	0.4%	0%	0%	0.3%	-	0%	0%	0%	0%	0%	-	0%	2.6%	9.3%	0%	2.9%	-	0%	0%	0%	0%	-	-	0.7%
Pedestrians	-	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	14	-	-	-	-	-	1	-
% Pedestrians	-	-	-	-	-	-100%	-	-	-	-	-	0%	-	-	-	-	-	-93.3%	-	-	-	-	-	-100%	-
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	0	-
% Bicycles on Crosswalk	-	-	-	-	-	0%	-	-	-	-	-	-100%	-	-	-	-	-	-6.7%	-	-	-	-	-	0%	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

207487-B Adams Street @ Furnace Brook Parkwa... - TMC

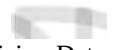
Thu Oct 1, 2020

AM Peak (Oct 01 2020 7:30AM - 8:30 AM)

All Classes (Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians,
Bicycles on Road, Bicycles on Crosswalk)

All Movements

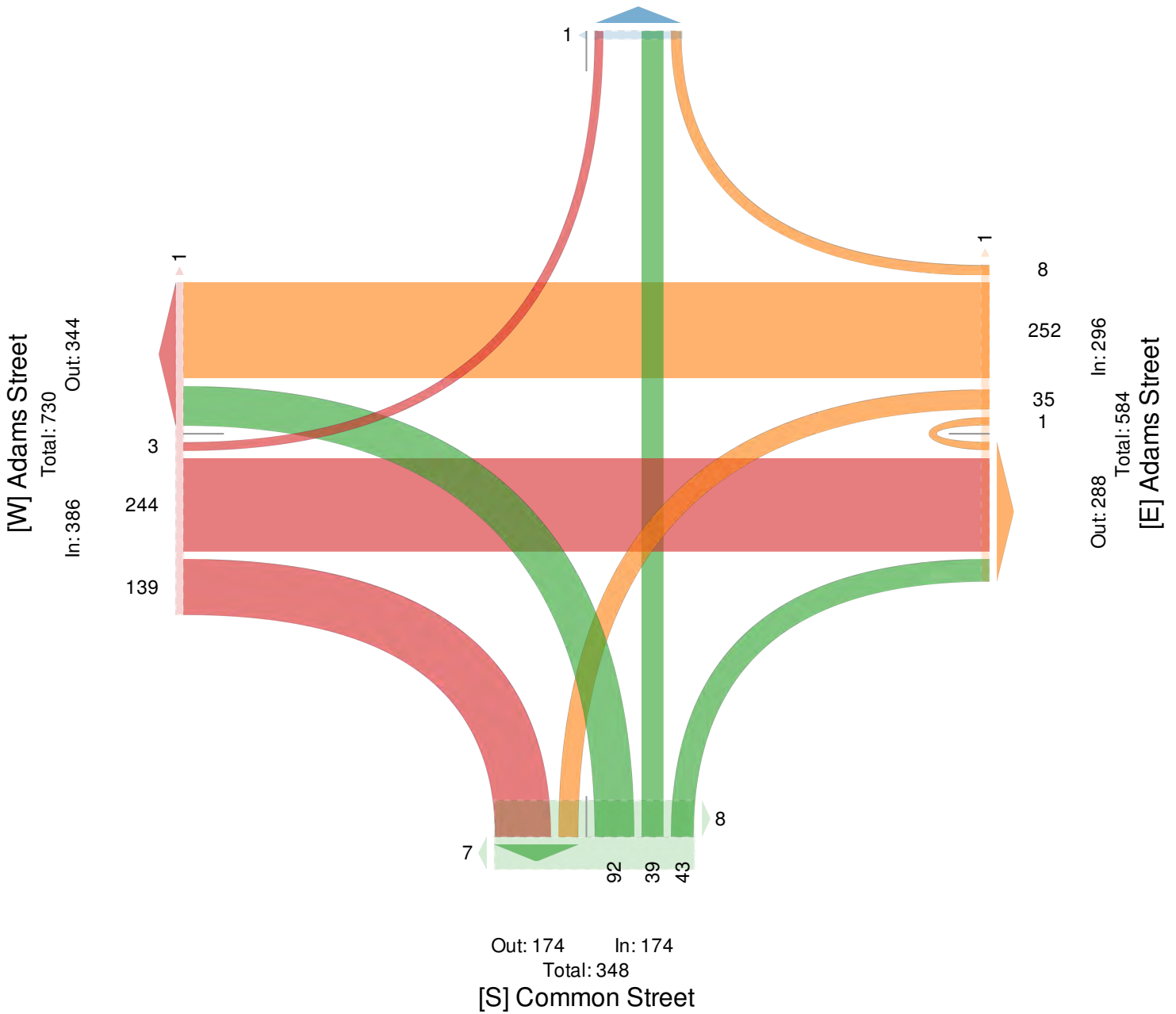
ID: 786555, Location: 42.253305, -71.024814



Provided by: Precision Data
Industries, LLC (PDI)
46 Morton Street,
Framingham, MA, MA, 01702, US

[N] Furnace Brook Parkway Ramp

Total: 50
In: 0 Out: 50



207487-B Adams Street @ Furnace Brook Parkwa... - TMC

Thu Oct 1, 2020

PM Peak (Oct 01 2020 4:45PM - 5:45 PM) - Overall Peak Hour

All Classes (Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

ID: 786555, Location: 42.253305, -71.024814

Provided by: Precision Data Industries, LLC
(PDI)
46 Morton Street,
Framingham, MA, MA, 01702, US

Leg Direction	Adams Street Eastbound						Adams Street Westbound						Common Street Northbound						Furnace Brook Parkway Ramp Southbound						Int
	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	
2020-10-01 4:45PM	0	98	70	0	168	0	4	61	2	1	68	0	28	11	12	0	51	1	0	0	0	0	0	0	287
5:00PM	0	85	45	1	131	0	14	70	0	0	84	1	34	25	8	0	67	3	0	0	0	0	0	0	282
5:15PM	0	83	51	0	134	0	10	58	1	0	69	2	24	17	7	0	48	2	0	0	0	0	0	0	251
5:30PM	0	103	56	0	159	2	7	81	3	0	91	0	21	16	10	0	47	5	0	0	0	0	0	10	297
Total	0	369	222	1	592	2	35	270	6	1	312	3	107	69	37	0	213	11	0	0	0	0	0	13	1117
% Approach	0%	62.3%	37.5%	0.2%	-	-	11.2%	86.5%	1.9%	0.3%	-	-	50.2%	32.4%	17.4%	0%	-	-	0%	0%	0%	0%	-	-	-
% Total	0%	33.0%	19.9%	0.1%	53.0%	-	3.1%	24.2%	0.5%	0.1%	27.9%	-	9.6%	6.2%	3.3%	0%	19.1%	-	0%	0%	0%	0%	0%	-	-
PHF	-	0.896	0.797	0.250	0.883	-	0.625	0.833	0.625	0.250	0.864	-	0.787	0.690	0.771	-	0.795	-	-	-	-	-	-	-	0.941
Lights	0	365	218	1	584	-	35	267	5	1	308	-	104	68	35	0	207	-	0	0	0	0	0	-	1099
% Lights	0%	98.9%	98.2%	100%	98.6%	-	100%	98.9%	83.3%	100%	98.7%	-	97.2%	98.6%	94.6%	0%	97.2%	-	0%	0%	0%	0%	-	-	98.4%
Single-Unit Trucks	0	4	1	0	5	-	0	3	0	0	3	-	2	1	2	0	5	-	0	0	0	0	0	-	13
% Single-Unit Trucks	0%	1.1%	0.5%	0%	0.8%	-	0%	1.1%	0%	0%	1.0%	-	1.9%	1.4%	5.4%	0%	2.3%	-	0%	0%	0%	0%	-	-	1.2%
Articulated Trucks	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0
% Articulated Trucks	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	-	-	0%
Buses	0	0	1	0	1	-	0	0	0	0	0	-	1	0	0	0	1	-	0	0	0	0	0	-	2
% Buses	0%	0%	0.5%	0%	0.2%	-	0%	0%	0%	0%	0%	-	0.9%	0%	0%	0%	0.5%	-	0%	0%	0%	0%	-	-	0.2%
Bicycles on Road	0	0	2	0	2	-	0	0	1	0	1	-	0	0	0	0	0	-	0	0	0	0	0	-	3
% Bicycles on Road	0%	0%	0.9%	0%	0.3%	-	0%	0%	16.7%	0%	0.3%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	-	-	0.3%
Pedestrians	-	-	-	-	-	2	-	-	-	-	-	3	-	-	-	-	-	11	-	-	-	-	-	13	-
% Pedestrians	-	-	-	-	-	-100%	-	-	-	-	-	-100%	-	-	-	-	-	-100%	-	-	-	-	-	-100%	-
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-
% Bicycles on Crosswalk	-	-	-	-	-	0%	-	-	-	-	-	0%	-	-	-	-	-	0%	-	-	-	-	-	0%	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

207487-B Adams Street @ Furnace Brook Parkwa... - TMC

Thu Oct 1, 2020

PM Peak (Oct 01 2020 4:45PM - 5:45 PM) - Overall Peak Hour

All Classes (Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

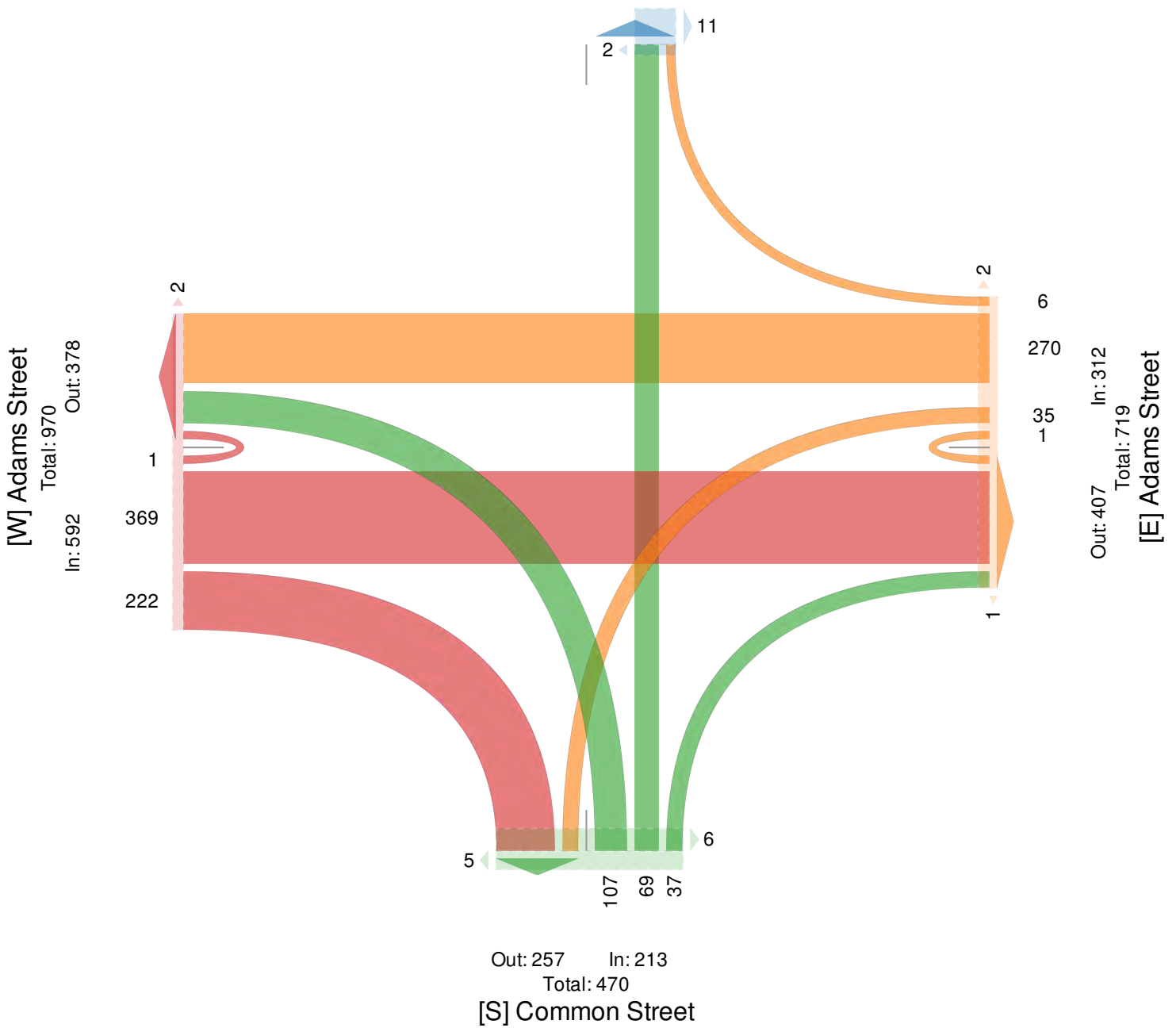
ID: 786555, Location: 42.253305, -71.024814



Provided by: Precision Data Industries, LLC (PDI)
46 Morton Street,
Framingham, MA, MA, 01702, US

[N] Furnace Brook Parkway Ramp

Total: 75
In: 0 Out: 75



APPENDIX G
Spot Speed Count Data
February 2020

Massachusetts Highway Department
S20-005-243-01: February 2020 speed Report

Location ID: S20-005-243-01
 County: Norfolk
 Community: Quincy
 Description: On ADAMS STREET at ALRICK RD.

Functional Class: 3
 Axle Factor Group: U3

DATE	DIR/LANE	0 - 10 MPH	10 - 15 MPH	15 - 20 MPH	20 - 25 MPH	25 - 30 MPH	30 - 35 MPH	35 - 40 MPH	40 - 45 MPH	45 - 50 MPH	50 - 55 MPH	55 - 60 MPH	60 - 65 MPH	65 - 70 MPH	70 - 250	250+ MPH	TOTAL
Mon 24	EB	31	65	223	461	2551	3595	1078	107	11	1	3	2	4	26	0	8158
Mon 24	WB	78	74	201	618	1886	2975	2344	702	100	17	1	0	0	1	0	8997
Tue 25	EB	17	39	165	359	2545	3643	1086	87	6	0	0	2	10	18	0	7977
Tue 25	WB	149	130	181	578	1833	2846	2265	626	99	13	3	3	0	1	0	8727
Wed 26	EB	22	30	146	324	2617	3617	1196	123	5	1	4	7	7	55	0	8154
Wed 26	WB	322	222	385	771	1956	2904	2127	612	85	13	3	0	0	1	0	9401
Thu 27	EB	25	32	148	252	2069	3771	1588	163	13	3	0	3	8	25	0	8100
Thu 27	WB	37	52	120	342	1580	2842	2451	731	89	16	3	1	0	2	0	8266
Fri 28	EB	30	20	164	339	2333	3813	1426	126	16	4	0	1	3	24	0	8299
Fri 28	WB	24	42	93	336	1335	2530	2152	691	94	17	7	1	0	0	0	7322

Percentages		.81%	.80%	2.11%	4.95%	24.09%	39.38%	21.87%	4.95%	.64%	.11%	.03%	.02%	.04%	.19%	0%	100%
Totals		780	775	2032	4771	23207	37949	21077	4769	617	104	31	22	35	185	0	96354

Massachusetts Highway Department

S20-005-243-03: February 2020 speed Report

Location ID: S20-005-243-03
 County: Norfolk
 Community: Quincy
 Description: On FURNACE BROOK PARKWAY at BRAE RD. AT 856 FURNACE BROOK PWY

Functional Class: 4
 Axle Factor Group: U4-7

DATE	DIR/LANE	0 - 10 MPH	10 - 15 MPH	15 - 20 MPH	20 - 25 MPH	25 - 30 MPH	30 - 35 MPH	35 - 40 MPH	40 - 45 MPH	45 - 50 MPH	50 - 55 MPH	55 - 60 MPH	60 - 65 MPH	65 - 70 MPH	70 - 250	250+ MPH	TOTAL
Thu 27	NB	96	29	57	167	881	2096	1703	300	18	2	2	0	0	3	0	5354
Thu 27	SB	158	108	206	470	1178	1682	1569	438	83	14	6	1	0	2	0	5915
Percentages		11.92%	1.30%	2.48%	5.17%	15.96%	30.39%	25.46%	6.19%	.87%	.13%	.04%	.02%	0%	.06%	0%	100%
Totals		9722	1058	2019	4215	13020	24793	20769	5052	713	103	36	19	4	48	0	81571

Massachusetts Highway Department

S20-005-243-04: February 2020 speed Report

Location ID: S20-005-243-04
 County: Norfolk
 Community: Quincy
 Description: On COMMON STREET at HILLTOP ST./ROOSEVELT RD.

Functional Class: 5
 Axle Factor Group: U4-7

DATE	DIR/LANE	0 - 10 MPH	10 - 15 MPH	15 - 20 MPH	20 - 25 MPH	25 - 30 MPH	30 - 35 MPH	35 - 40 MPH	40 - 45 MPH	45 - 50 MPH	50 - 55 MPH	55 - 60 MPH	60 - 65 MPH	65 - 70 MPH	70 - 250	250+ MPH	TOTAL
Mon 24	NB	369	254	976	1464	340	123	38	10	1	1	1	0	0	1	0	3578
Mon 24	SB	36	73	374	1479	969	117	6	1	1	0	0	0	0	0	0	3056
Tue 25	NB	289	282	957	1370	304	85	40	8	1	0	0	0	0	0	0	3336
Tue 25	SB	22	62	404	1475	908	78	9	0	0	0	0	0	0	1	0	2959
Wed 26	NB	658	336	903	1381	310	81	25	18	3	0	0	0	0	0	0	3715
Wed 26	SB	34	65	379	1492	884	116	10	0	0	0	0	0	0	0	0	2980
Thu 27	NB	140	202	915	1406	322	88	37	10	0	0	0	0	0	0	0	3120
Thu 27	SB	25	69	389	1465	963	115	2	0	1	0	0	0	0	0	0	3029
Fri 28	NB	65	114	778	1338	332	91	53	16	3	0	0	0	0	0	0	2790
Fri 28	SB	15	40	315	1477	1010	122	6	0	0	0	0	0	0	0	0	2985
Sat 29	NB	16	70	618	1109	287	93	45	7	0	0	0	0	0	3	0	2248
Sat 29	SB	18	22	239	1072	766	92	7	0	0	0	0	0	0	0	0	2216
Percentages		4.68%	4.41%	20.12%	45.90%	20.53%	3.33%	.77%	.19%	.03%	0%	0%	0%	0%	.01%	0%	100%
Totals		1687	1589	7247	16528	7395	1201	278	70	10	1	1	0	0	5	0	36012

APPENDIX H
Intersection Capacity Analyses
Estimated 2020 Existing Conditions

Intersection Capacity Analysis
 Adams Street at Furnace Brook Parkway

01/12/2021



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕↕		↖	↕↕			↖	↖		↕↕	
Traffic Volume (vph)	84	342	122	69	419	0	116	205	74	71	320	191
Future Volume (vph)	84	342	122	69	419	0	116	205	74	71	320	191
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	16	12	12	16	12
Storage Length (ft)	0		0	0		0	0		50	0		0
Storage Lanes	0		0	1		0	0		1	0		0
Taper Length (ft)	170			25			25			25		
Right Turn on Red			No			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		329			132			636			144	
Travel Time (s)		7.5			3.0			14.5			3.3	
Confl. Peds. (#/hr)	2		11	11		2	6		9	9		6
Peak Hour Factor	0.90	0.90	0.90	0.95	0.95	0.95	0.95	0.95	0.95	0.75	0.75	0.75
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	3%	3%	3%	2%	2%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	609	0	73	441	0	0	338	78	0	777	0
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6			2			4		4	8		
Detector Phase	6	6		2	2		4	4	4	8	8	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	1.0	1.0	
Minimum Split (s)	27.0	27.0		27.0	27.0		27.0	27.0	27.0	27.0	27.0	
Total Split (s)	46.0	46.0		46.0	46.0		56.0	56.0	56.0	56.0	56.0	
Total Split (%)	35.7%	35.7%		35.7%	35.7%		43.4%	43.4%	43.4%	43.4%	43.4%	
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		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		0.0		0.0	0.0			0.0	0.0		0.0	
Total Lost Time (s)		6.0		6.0	6.0			6.0	6.0		6.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Max	Max		Max	Max		None	None	None	None	None	
Act Effect Green (s)		40.5		40.5	40.5			50.7	50.7		50.7	
Actuated g/C Ratio		0.36		0.36	0.36			0.45	0.45		0.45	
v/c Ratio		0.68		0.36	0.35			0.78	0.11		1.07	
Control Delay		37.5		37.2	29.5			43.2	7.6		84.4	
Queue Delay		0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay		37.5		37.2	29.5			43.2	7.6		84.4	
LOS		D		D	C			D	A		F	
Approach Delay		37.5			30.6			36.6			84.4	
Approach LOS		D			C			D			F	
Queue Length 50th (ft)		165		33	103			166	3		470	
Queue Length 95th (ft)		320		99	203			#451	38		#771	
Internal Link Dist (ft)		249			52			556			64	
Turn Bay Length (ft)									50			
Base Capacity (vph)		896		204	1247			436	728		727	
Starvation Cap Reductn		0		0	0			0	0		0	
Spillback Cap Reductn		0		0	0			0	0		0	

Intersection Capacity Analysis
 Adams Street at Furnace Brook Parkway

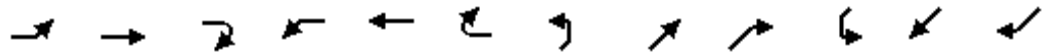
01/12/2021

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Right Turn on Red	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	15.0
Minimum Split (s)	27.0
Total Split (s)	27.0
Total Split (%)	21%
Yellow Time (s)	3.0
All-Red Time (s)	2.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	None
Act Effect Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	

Intersection Capacity Analysis

Adams Street at Furnace Brook Parkway

01/12/2021



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Storage Cap Reductn		0		0	0			0	0		0	
Reduced v/c Ratio		0.68		0.36	0.35			0.78	0.11		1.07	

Intersection Summary

Area Type:	Other
Cycle Length:	129
Actuated Cycle Length:	112.8
Natural Cycle:	145
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	1.07
Intersection Signal Delay:	51.5
Intersection LOS:	D
Intersection Capacity Utilization	97.5%
ICU Level of Service	F
Analysis Period (min)	15
# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.	

Splits and Phases: 3:

Ø2 46 s	Ø4 56 s	Ø9 27 s
Ø6 46 s	Ø8 56 s	

HCM Unsignalized Intersection Capacity Analysis

Adams Street at Common Street

01/12/2021



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↖	↑↑			↑↓				
Traffic Volume (veh/h)	0	309	176	48	337	11	155	66	72	0	0	0
Future Volume (Veh/h)	0	309	176	48	337	11	155	66	72	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.86	0.86	0.86	0.82	0.82	0.82	0.92	0.92	0.92
Hourly flow rate (vph)	0	336	191	56	392	13	189	80	88	0	0	0
Pedestrians		1			1			15			1	
Lane Width (ft)		12.0			14.0			12.0			0.0	
Walking Speed (ft/s)		3.5			3.5			3.5			3.5	
Percent Blockage		0			0			1			0	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)		132										
pX, platoon unblocked				0.93			0.93	0.93	0.93	0.93	0.93	
vC, conflicting volume	406			542			756	964	280	808	1054	204
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	406			349			579	805	66	636	901	204
tC, single (s)	4.2			4.2			7.6	6.6	7.0	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			95			44	70	90	100	100	100
cM capacity (veh/h)	1142			1096			340	268	890	222	240	801
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1						
Volume Total	224	303	56	261	144	357						
Volume Left	0	0	56	0	0	189						
Volume Right	0	191	0	0	13	88						
cSH	1700	1700	1096	1700	1700	375						
Volume to Capacity	0.13	0.18	0.05	0.15	0.08	0.95						
Queue Length 95th (ft)	0	0	4	0	0	263						
Control Delay (s)	0.0	0.0	8.5	0.0	0.0	69.1						
Lane LOS			A			F						
Approach Delay (s)	0.0		1.0			69.1						
Approach LOS						F						
Intersection Summary												
Average Delay			18.7									
Intersection Capacity Utilization			47.9%	ICU Level of Service	A							
Analysis Period (min)			15									

Intersection Capacity Analysis
 Adams Street at Furnace Brook Parkway

01/12/2021



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕↕		↕	↕↕			↕	↕			↕↕
Traffic Volume (vph)	141	500	114	34	422	0	143	253	88	67	297	139
Future Volume (vph)	141	500	114	34	422	0	143	253	88	67	297	139
Confl. Peds. (#/hr)	27		17	17		27	22		14	14		22
Peak Hour Factor	0.91	0.91	0.91	0.87	0.87	0.87	0.94	0.94	0.94	0.91	0.91	0.91
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	1%	1%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	829	0	39	485	0	0	421	94	0	553	0
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		6			2			4				8
Permitted Phases	6			2			4		4	8		
Detector Phase	6	6		2	2		4	4	4	8		8
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	1.0	1.0	
Minimum Split (s)	27.0	27.0		27.0	27.0		27.0	27.0	27.0	27.0	27.0	
Total Split (s)	46.0	46.0		46.0	46.0		56.0	56.0	56.0	56.0	56.0	
Total Split (%)	35.7%	35.7%		35.7%	35.7%		43.4%	43.4%	43.4%	43.4%	43.4%	
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		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		0.0		0.0	0.0			0.0	0.0		0.0	
Total Lost Time (s)		6.0		6.0	6.0			6.0	6.0		6.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Max	Max		Max	Max		None	None	None	None	None	
Act Effect Green (s)		40.5		40.5	40.5			50.7	50.7		50.7	
Actuated g/C Ratio		0.36		0.36	0.36			0.45	0.45		0.45	
v/c Ratio		0.98		0.31	0.38			0.78	0.13		0.81	
Control Delay		62.8		39.7	29.9			41.3	9.2		39.3	
Queue Delay		0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay		62.8		39.7	29.9			41.3	9.2		39.3	
LOS		E		D	C			D	A		D	
Approach Delay		62.8			30.6			35.4			39.3	
Approach LOS		E			C			D			D	
Queue Length 50th (ft)		261		17	115			208	9		270	
Queue Length 95th (ft)		#552		61	214			#534	50		#661	
Internal Link Dist (ft)		249			52			556			64	
Turn Bay Length (ft)									50			
Base Capacity (vph)		849		124	1271			537	739		684	
Starvation Cap Reductn		0		0	0			0	0		0	
Spillback Cap Reductn		0		0	0			0	0		0	
Storage Cap Reductn		0		0	0			0	0		0	
Reduced v/c Ratio		0.98		0.31	0.38			0.78	0.13		0.81	

Intersection Summary

Cycle Length: 129
 Actuated Cycle Length: 112.8
 Natural Cycle: 135
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.98

Intersection Capacity Analysis
 Adams Street at Furnace Brook Parkway

01/12/2021

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	15.0
Minimum Split (s)	27.0
Total Split (s)	27.0
Total Split (%)	21%
Yellow Time (s)	3.0
All-Red Time (s)	2.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	None
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	
Intersection Summary	

Intersection Capacity Analysis Adams Street at Furnace Brook Parkway

01/12/2021

Intersection Signal Delay: 44.6

Intersection LOS: D

Intersection Capacity Utilization 103.1%

ICU Level of Service G

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 3:



HCM Unsignalized Intersection Capacity Analysis

Adams Street at Common Street

01/12/2021

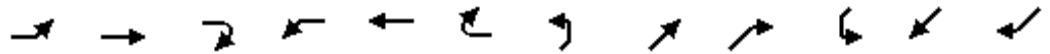


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↖	↑↑			↕				
Traffic Volume (veh/h)	0	413	248	43	325	7	130	84	45	0	0	0
Future Volume (Veh/h)	0	413	248	43	325	7	130	84	45	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.86	0.86	0.86	0.80	0.80	0.80	0.92	0.92	0.92
Hourly flow rate (vph)	0	469	282	50	378	8	163	105	56	0	0	0
Pedestrians		2			3			11			13	
Lane Width (ft)		12.0			14.0			12.0			0.0	
Walking Speed (ft/s)		3.5			3.5			3.5			3.5	
Percent Blockage		0			0			1			0	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)		132										
pX, platoon unblocked				0.81			0.81	0.81	0.81	0.81	0.81	
vC, conflicting volume	399			762			912	1120	390	841	1257	208
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	399			242			427	683	0	340	852	208
tC, single (s)	4.1			4.1			7.6	6.6	7.0	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			95			58	63	94	100	100	100
cM capacity (veh/h)	1156			1067			390	282	865	304	226	796
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1						
Volume Total	313	438	50	252	134	324						
Volume Left	0	0	50	0	0	163						
Volume Right	0	282	0	0	8	56						
cSH	1700	1700	1067	1700	1700	379						
Volume to Capacity	0.18	0.26	0.05	0.15	0.08	0.86						
Queue Length 95th (ft)	0	0	4	0	0	203						
Control Delay (s)	0.0	0.0	8.5	0.0	0.0	50.6						
Lane LOS			A			F						
Approach Delay (s)	0.0		1.0			50.6						
Approach LOS						F						
Intersection Summary												
Average Delay			11.1									
Intersection Capacity Utilization			51.3%	ICU Level of Service	A							
Analysis Period (min)			15									

APPENDIX I
Intersection Capacity Analyses
2020 Signal Retiming Scenario

Intersection Capacity Analysis
 Adams Street at Furnace Brook Parkway

01/22/2021



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	84	342	122	69	419	0	116	205	74	71	320	191
Future Volume (vph)	84	342	122	69	419	0	116	205	74	71	320	191
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	16	12	12	16	12
Storage Length (ft)	0		0	0		0	0		50	0		0
Storage Lanes	0		0	1		0	0		1	0		0
Taper Length (ft)	170			25			25			25		
Right Turn on Red			No			Yes			Yes			Yes
Link Speed (mph)		30			30			30				30
Link Distance (ft)		329			132			636				144
Travel Time (s)		7.5			3.0			14.5				3.3
Confl. Peds. (#/hr)	2		11	11		2	6		9	9		6
Peak Hour Factor	0.90	0.90	0.90	0.95	0.95	0.95	0.95	0.95	0.95	0.75	0.75	0.75
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	3%	3%	3%	2%	2%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	609	0	73	441	0	0	338	78	0	777	0
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		6			2			4				8
Permitted Phases	6			2			4		4	8		
Detector Phase	6	6		2	2		4	4	4	8		8
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	1.0	1.0	
Minimum Split (s)	27.0	27.0		27.0	27.0		27.0	27.0	27.0	27.0	27.0	
Total Split (s)	42.0	42.0		42.0	42.0		66.0	66.0	66.0	66.0	66.0	
Total Split (%)	31.1%	31.1%		31.1%	31.1%		48.9%	48.9%	48.9%	48.9%	48.9%	
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		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		0.0		0.0	0.0			0.0	0.0		0.0	
Total Lost Time (s)		6.0		6.0	6.0			6.0	6.0		6.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Max	Max		Max	Max		None	None	None	None	None	
Act Effect Green (s)		36.4		36.4	36.4			60.7	60.7			60.7
Actuated g/C Ratio		0.31		0.31	0.31			0.51	0.51			0.51
v/c Ratio		0.82		0.47	0.41			0.62	0.10			0.89
Control Delay		50.1		50.0	36.1			30.2	6.8			40.9
Queue Delay		0.0		0.0	0.0			0.0	0.0			0.0
Total Delay		50.1		50.0	36.1			30.2	6.8			40.9
LOS		D		D	D			C	A			D
Approach Delay		50.1			38.0			25.8				40.9
Approach LOS		D			D			C				D
Queue Length 50th (ft)		196		39	121			145	4			405
Queue Length 95th (ft)		#396		114	225			367	37			641
Internal Link Dist (ft)		249			52			556				64
Turn Bay Length (ft)									50			
Base Capacity (vph)		743		154	1064			543	818			876
Starvation Cap Reductn		0		0	0			0	0			0
Spillback Cap Reductn		0		0	0			0	0			0

Intersection Capacity Analysis
 Adams Street at Furnace Brook Parkway

01/22/2021

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Right Turn on Red	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	15.0
Minimum Split (s)	27.0
Total Split (s)	27.0
Total Split (%)	20%
Yellow Time (s)	3.0
All-Red Time (s)	2.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	None
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	

Intersection Capacity Analysis
 Adams Street at Furnace Brook Parkway

01/22/2021



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Storage Cap Reductn		0		0	0			0	0		0	
Reduced v/c Ratio		0.82		0.47	0.41			0.62	0.10		0.89	

Intersection Summary

Area Type: Other
 Cycle Length: 135
 Actuated Cycle Length: 118.8
 Natural Cycle: 145
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.89
 Intersection Signal Delay: 40.0 Intersection LOS: D
 Intersection Capacity Utilization 97.5% ICU Level of Service F
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 3:



Intersection Capacity Analysis
 Adams Street at Furnace Brook Parkway

01/22/2021



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↔↔		↔	↔↔			↔	↔		↔	
Traffic Volume (vph)	141	500	114	34	422	0	143	253	88	67	297	139
Future Volume (vph)	141	500	114	34	422	0	143	253	88	67	297	139
Confl. Peds. (#/hr)	27		17	17		27	22		14	14		22
Peak Hour Factor	0.91	0.91	0.91	0.87	0.87	0.87	0.94	0.94	0.94	0.91	0.91	0.91
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	1%	1%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	829	0	39	485	0	0	421	94	0	553	0
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		6			2			4				8
Permitted Phases	6			2			4		4	8		
Detector Phase	6	6		2	2		4	4	4	8		8
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	1.0	1.0	
Minimum Split (s)	27.0	27.0		27.0	27.0		27.0	27.0	27.0	27.0	27.0	
Total Split (s)	51.0	51.0		51.0	51.0		57.0	57.0	57.0	57.0	57.0	
Total Split (%)	37.8%	37.8%		37.8%	37.8%		42.2%	42.2%	42.2%	42.2%	42.2%	
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		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		0.0		0.0	0.0			0.0	0.0		0.0	
Total Lost Time (s)		6.0		6.0	6.0			6.0	6.0		6.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Max	Max		Max	Max		None	None	None	None	None	
Act Effect Green (s)		45.5		45.5	45.5			51.6	51.6		51.6	
Actuated g/C Ratio		0.38		0.38	0.38			0.43	0.43		0.43	
v/c Ratio		0.91		0.27	0.36			0.83	0.13		0.87	
Control Delay		51.1		36.6	29.0			47.5	10.2		47.5	
Queue Delay		0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay		51.1		36.6	29.0			47.5	10.2		47.5	
LOS		D		D	C			D	B		D	
Approach Delay		51.1			29.6			40.7			47.5	
Approach LOS		D			C			D			D	
Queue Length 50th (ft)		264		17	117			233	11		307	
Queue Length 95th (ft)		#546		59	215			#573	54		#723	
Internal Link Dist (ft)		249			52			556			64	
Turn Bay Length (ft)									50			
Base Capacity (vph)		912		143	1356			509	715		635	
Starvation Cap Reductn		0		0	0			0	0		0	
Spillback Cap Reductn		0		0	0			0	0		0	
Storage Cap Reductn		0		0	0			0	0		0	
Reduced v/c Ratio		0.91		0.27	0.36			0.83	0.13		0.87	
Intersection Summary												
Cycle Length: 135												
Actuated Cycle Length: 118.8												
Natural Cycle: 135												
Control Type: Actuated-Uncoordinated												
Maximum v/c Ratio: 0.91												

Intersection Capacity Analysis
 Adams Street at Furnace Brook Parkway

01/22/2021

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	15.0
Minimum Split (s)	27.0
Total Split (s)	27.0
Total Split (%)	20%
Yellow Time (s)	3.0
All-Red Time (s)	2.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	None
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	
Intersection Summary	

Intersection Capacity Analysis

Adams Street at Furnace Brook Parkway

01/22/2021

Intersection Signal Delay: 43.4

Intersection LOS: D

Intersection Capacity Utilization 103.1%






ICU Level of Service G

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 3:

 Ø2	 Ø4	 Ø9
51 s	57 s	27 s
 Ø6	 Ø8	
51 s	57 s	

APPENDIX J

Intersection Capacity Analyses No-Build and Proposed Alternatives 2030 Projected Traffic Conditions

Table I-1
Intersection Capacity Analysis
No-Build Scenario under Projected 2030 AM and PM Peak-Hour Traffic Conditions

Intersection Approach	Lane Group	AM LOS	AM Delay	AM V/C	95th Queue	PM LOS	PM Delay	PM V/C	95th Queue
Adams Street EB	L/T/R	D	47	0.82	#398	E	74	1.03	#596
Adams Street WB	L	D	47	0.48	114	D	42	0.36	61
Adams Street WB	T/R	C	33	0.41	223	C	30	0.39	224
Furnace Brook Parkway NB	L/T	D	38	0.74	#451	D	44	0.78	#606
Furnace Brook Parkway NB	R	A	7	0.10	39	A	10	0.14	54
Furnace Brook Parkway SB	L/T/R	E	69	1.03	#777	E	56	0.94	#771
Intersection (1) Average	-	D	49	-	-	D	54	-	-
Adams Street EB	T/R	A	0	0.19	-	A	0	0.27	-
Adams Street WB	L	A	8	0.05	4	A	9	0.05	4
Adams Street WB	T/R	A	0	0.16	-	A	0	0.16	-
Common Street NB	L/T/R	F	76	0.98	263	F	74	0.96	264
Intersection (2) Average	-	C	21	-	-	C	16	-	-

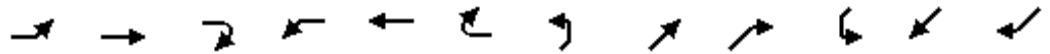
Notes:

- Intersection: (1) Adams Street at Furnace Brook Parkway, (2) Adams Street at Common Street
- Approach: NB = Northbound, SB = Southbound, EB = Eastbound, WB = Westbound
- Turning movement: L = Left turn, T = Through movement, R = Right turn
- LOS = Level of Service
- Delay (seconds) = Average delay per vehicle
- V/C = Volume to capacity ratio
- #: 95th percentile volume exceeds capacity. The queue shown is maximum after two cycles.
- #: 95th percentile volume exceeds capacity. Queue shown is maximum after two cycles.

Intersection Capacity Analysis

Adams Street at Furnace Brook Parkway

01/18/2021



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕↕		↕	↕↕			↕	↕		↕↕	
Traffic Volume (vph)	84	342	122	69	419	0	116	205	74	71	320	191
Future Volume (vph)	84	342	122	69	419	0	116	205	74	71	320	191
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	16	12	12	16	12
Storage Length (ft)	0		0	0		0	0		50	0		0
Storage Lanes	0		0	1		0	0		1	0		0
Taper Length (ft)	170			25			25			25		
Right Turn on Red			No			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		329			132			636			144	
Travel Time (s)		7.5			3.0			14.5			3.3	
Confl. Peds. (#/hr)	2		11	11		2	6		9	9		6
Peak Hour Factor	0.90	0.90	0.90	0.95	0.95	0.95	0.95	0.95	0.95	0.75	0.75	0.75
Growth Factor	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	3%	3%	3%	2%	2%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	639	0	76	463	0	0	355	82	0	814	0
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6			2			4		4	8		
Detector Phase	6	6		2	2		4	4	4	8	8	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	1.0	1.0	
Minimum Split (s)	27.0	27.0		27.0	27.0		27.0	27.0	27.0	27.0	27.0	
Total Split (s)	42.0	42.0		42.0	42.0		60.0	60.0	60.0	60.0	60.0	
Total Split (%)	32.6%	32.6%		32.6%	32.6%		46.5%	46.5%	46.5%	46.5%	46.5%	
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		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		0.0		0.0	0.0			0.0	0.0		0.0	
Total Lost Time (s)		6.0		6.0	6.0			6.0	6.0		6.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Max	Max		Max	Max		None	None	None	None	None	
Act Effect Green (s)		36.5		36.5	36.5			54.7	54.7		54.7	
Actuated g/C Ratio		0.32		0.32	0.32			0.48	0.48		0.48	
v/c Ratio		0.82		0.48	0.41			0.74	0.10		1.03	
Control Delay		46.9		47.0	33.1			37.6	7.2		68.5	
Queue Delay		0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay		46.9		47.0	33.1			37.6	7.2		68.5	
LOS		D		D	C			D	A		E	
Approach Delay		46.9			35.1			31.9			68.5	
Approach LOS		D			D			C			E	
Queue Length 50th (ft)		190		37	117			161	4		464	
Queue Length 95th (ft)		#398		114	223			#451	39		#777	
Internal Link Dist (ft)		249			52			556			64	
Turn Bay Length (ft)									50			
Base Capacity (vph)		780		159	1122			480	781		794	
Starvation Cap Reductn		0		0	0			0	0		0	

Intersection Capacity Analysis
 Adams Street at Furnace Brook Parkway

01/18/2021

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Right Turn on Red	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	15.0
Minimum Split (s)	27.0
Total Split (s)	27.0
Total Split (%)	21%
Yellow Time (s)	3.0
All-Red Time (s)	2.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	None
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	

Intersection Capacity Analysis

Adams Street at Furnace Brook Parkway

01/18/2021



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Spillback Cap Reductn		0		0	0			0	0		0	
Storage Cap Reductn		0		0	0			0	0		0	
Reduced v/c Ratio		0.82		0.48	0.41			0.74	0.10		1.03	

Intersection Summary

Area Type:	Other
Cycle Length:	129
Actuated Cycle Length:	112.8
Natural Cycle:	145
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	1.03
Intersection Signal Delay:	48.8
Intersection LOS:	D
Intersection Capacity Utilization	101.3%
ICU Level of Service	G
Analysis Period (min)	15
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

















Splits and Phases: 3:



HCM Unsignalized Intersection Capacity Analysis

Adams Street at Common Street

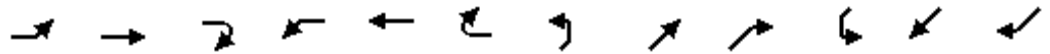
01/18/2021

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	309	176	48	337	11	155	66	72	0	0	0
Future Volume (Veh/h)	0	309	176	48	337	11	155	66	72	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.86	0.86	0.86	0.82	0.82	0.82	0.92	0.92	0.92
Hourly flow rate (vph)	0	353	201	59	411	13	198	85	92	0	0	0
Pedestrians		1			1			15			1	
Lane Width (ft)		12.0			14.0			12.0			0.0	
Walking Speed (ft/s)		3.5			3.5			3.5			3.5	
Percent Blockage		0			0			1			0	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)		132										
pX, platoon unblocked				0.90			0.90	0.90	0.90	0.90	0.90	
vC, conflicting volume	425			569			793	1012	293	848	1106	214
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	425			295			544	787	0	606	892	214
tC, single (s)	4.2			4.2			7.6	6.6	7.0	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			95			43	68	90	100	100	100
cM capacity (veh/h)	1124			1113			349	265	951	221	235	790
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1						
Volume Total	235	319	59	274	150	375						
Volume Left	0	0	59	0	0	198						
Volume Right	0	201	0	0	13	92						
cSH	1700	1700	1113	1700	1700	381						
Volume to Capacity	0.14	0.19	0.05	0.16	0.09	0.98						
Queue Length 95th (ft)	0	0	4	0	0	287						
Control Delay (s)	0.0	0.0	8.4	0.0	0.0	75.7						
Lane LOS			A			F						
Approach Delay (s)	0.0		1.0			75.7						
Approach LOS						F						
Intersection Summary												
Average Delay			20.5									
Intersection Capacity Utilization			49.6%		ICU Level of Service			A				
Analysis Period (min)			15									

Intersection Capacity Analysis

Adams Street at Furnace Brook Parkway

01/18/2021



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕↕		↕	↕↕			↕	↕		↕↕	
Traffic Volume (vph)	141	500	114	34	422	0	143	253	88	67	297	139
Future Volume (vph)	141	500	114	34	422	0	143	253	88	67	297	139
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	16	12	12	16	12
Storage Length (ft)	0		0	0		0	0		50	0		0
Storage Lanes	0		0	1		0	0		1	0		0
Taper Length (ft)	170			25			25			25		
Right Turn on Red			No			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		329			132			636			144	
Travel Time (s)		7.5			3.0			14.5			3.3	
Confl. Peds. (#/hr)	27		17	17		27	22		14	14		22
Peak Hour Factor	0.91	0.91	0.91	0.87	0.87	0.87	0.94	0.94	0.94	0.91	0.91	0.91
Growth Factor	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	1%	1%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	879	0	41	514	0	0	446	99	0	586	0
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6			2			4		4	8		
Detector Phase	6	6		2	2		4	4	4	8	8	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	1.0	1.0	
Minimum Split (s)	27.0	27.0		27.0	27.0		27.0	27.0	27.0	27.0	27.0	
Total Split (s)	47.0	47.0		47.0	47.0		55.0	55.0	55.0	55.0	55.0	
Total Split (%)	36.4%	36.4%		36.4%	36.4%		42.6%	42.6%	42.6%	42.6%	42.6%	
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		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		0.0		0.0	0.0			0.0	0.0		0.0	
Total Lost Time (s)		6.0		6.0	6.0			6.0	6.0		6.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Max	Max		Max	Max		None	None	None	None	None	
Act Effect Green (s)		41.5		41.5	41.5			49.7	49.7		49.7	
Actuated g/C Ratio		0.37		0.37	0.37			0.44	0.44		0.44	
v/c Ratio		1.03		0.36	0.39			0.88	0.14		0.94	
Control Delay		74.0		42.1	29.4			51.9	9.8		56.3	
Queue Delay		0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay		74.0		42.1	29.4			51.9	9.8		56.3	
LOS		E		D	C			D	A		E	
Approach Delay		74.0			30.3			44.3			56.3	
Approach LOS		E			C			D			E	
Queue Length 50th (ft)		284		18	121			238	10		320	
Queue Length 95th (ft)		#596		65	224			#606	54		#771	
Internal Link Dist (ft)		249			52			556			64	
Turn Bay Length (ft)									50			
Base Capacity (vph)		857		115	1303			505	725		622	
Starvation Cap Reductn		0		0	0			0	0		0	

Intersection Capacity Analysis
 Adams Street at Furnace Brook Parkway

01/18/2021

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Right Turn on Red	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	15.0
Minimum Split (s)	27.0
Total Split (s)	27.0
Total Split (%)	21%
Yellow Time (s)	3.0
All-Red Time (s)	2.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	None
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	

Intersection Capacity Analysis
 Adams Street at Furnace Brook Parkway

01/18/2021



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Spillback Cap Reductn		0		0	0			0	0		0	
Storage Cap Reductn		0		0	0			0	0		0	
Reduced v/c Ratio		1.03		0.36	0.39			0.88	0.14		0.94	

Intersection Summary

Area Type:	Other
Cycle Length:	129
Actuated Cycle Length:	112.8
Natural Cycle:	135
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	1.03
Intersection Signal Delay:	54.2
Intersection LOS:	D
Intersection Capacity Utilization	108.0%
ICU Level of Service	G
Analysis Period (min)	15
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 3:



HCM Unsignalized Intersection Capacity Analysis

Adams Street at Common Street

01/18/2021





















												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 		 	 			 				
Traffic Volume (veh/h)	0	413	248	43	325	7	130	84	45	0	0	0
Future Volume (Veh/h)	0	413	248	43	325	7	130	84	45	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.86	0.86	0.86	0.80	0.80	0.80	0.92	0.92	0.92
Hourly flow rate (vph)	0	497	299	53	401	9	172	111	60	0	0	0
Pedestrians		2			3			11			13	
Lane Width (ft)		12.0			14.0			12.0			0.0	
Walking Speed (ft/s)		3.5			3.5			3.5			3.5	
Percent Blockage		0			0			1			0	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)		132										
pX, platoon unblocked				0.80			0.80	0.80	0.80	0.80	0.80	
vC, conflicting volume	423			807			966	1186	412	892	1332	220
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	423			250			450	726	0	356	908	220
tC, single (s)	4.1			4.1			7.6	6.6	7.0	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			95			53	57	93	100	100	100
cM capacity (veh/h)	1133			1041			368	260	850	271	205	782
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1						
Volume Total	331	465	53	267	143	343						
Volume Left	0	0	53	0	0	172						
Volume Right	0	299	0	0	9	60						
cSH	1700	1700	1041	1700	1700	356						
Volume to Capacity	0.19	0.27	0.05	0.16	0.08	0.96						
Queue Length 95th (ft)	0	0	4	0	0	264						
Control Delay (s)	0.0	0.0	8.6	0.0	0.0	73.7						
Lane LOS			A			F						
Approach Delay (s)	0.0		1.0			73.7						
Approach LOS						F						
Intersection Summary												
Average Delay			16.1									
Intersection Capacity Utilization			53.5%	ICU Level of Service	A							
Analysis Period (min)			15									

Table I-2
Intersection Capacity Analysis
Alternative 1 under Projected 2030 AM and PM Peak-Hour Traffic Conditions

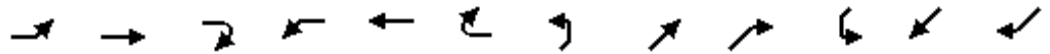
Intersection Approach	Lane Group	AM LOS	AM Delay	AM V/C	95th Queue	PM LOS	PM Delay	PM V/C	95th Queue
Adams Street EB	L	C	26	0.37	82	C	33	0.57	#165
Adams Street EB	T/R	C	32	0.64	#242	C	31	0.64	#340
Adams Street WB	L	C	26	0.33	67	C	22	0.19	40
Adams Street WB	T/R	C	29	0.53	189	C	29	0.51	196
Furnace Brook Parkway NB	L	E	58	0.77	#168	D	40	0.67	#171
Furnace Brook Parkway NB	T/R	D	36	0.64	#333	D	42	0.77	#412
Furnace Brook Parkway SB	L	C	26	0.34	68	C	26	0.36	67
Furnace Brook Parkway SB	T	E	64	0.95	#394	D	39	0.73	#345
Furnace Brook Parkway SB	R	D	40	0.68	#215	C	31	0.42	149
Intersection (1) Average	-	D	39	-	-	C	34	-	-
Adams Street EB	T/R	A	0	0.19	-	A	0	0.27	-
Adams Street WB	L	A	8	0.05	4	A	9	0.05	4
Adams Street WB	T/R	A	0	0.16	-	A	0	0.16	-
Common Street NB	L/T/R	F	63	0.94	259	F	101	1.05	312
Intersection (2) Average	-	C	17	-	-	C	22	-	-

Notes:

- Intersection: (1) Adams Street at Furnace Brook Parkway, (2) Adams Street at Common Street
- Approach: NB = Northbound, SB = Southbound, EB = Eastbound, WB = Westbound
- Turning movement: L = Left turn, T = Through movement, R = Right turn
- LOS = Level of Service
- Delay (seconds) = Average delay per vehicle
- V/C = Volume to capacity ratio
- #: 95th percentile volume exceeds capacity. The queue shown is maximum after two cycles.
- #: 95th percentile volume exceeds capacity. Queue shown is maximum after two cycles.

Intersection Capacity Analysis
 Adams Street at Furnace Brook Parkway

01/12/2021



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	84	342	122	69	419	0	116	205	74	71	320	191
Future Volume (vph)	84	342	122	69	419	0	116	205	74	71	320	191
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		0	0		0	125		0	75		0
Storage Lanes	1		0	1		0	1		0	1		1
Taper Length (ft)	170			25			25			25		
Right Turn on Red			No			No			No			No
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		426			132			636			144	
Travel Time (s)		9.7			3.0			14.5			3.3	
Confl. Peds. (#/hr)	2		11	11		2	6		9	9		6
Peak Hour Factor	0.90	0.90	0.90	0.95	0.95	0.95	0.95	0.95	0.95	0.75	0.75	0.75
Growth Factor	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	3%	3%	3%	2%	2%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	98	541	0	76	463	0	128	309	0	99	448	267
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		8
Detector Phase	1	6		5	2		7	4		3	8	8
Switch Phase												
Minimum Initial (s)	3.0	5.0		3.0	5.0		3.0	5.0		3.0	5.0	5.0
Minimum Split (s)	7.0	27.0		7.0	27.0		7.0	27.0		7.0	27.0	27.0
Total Split (s)	7.0	27.0		7.0	27.0		7.0	27.0		7.0	27.0	27.0
Total Split (%)	7.4%	28.4%		7.4%	28.4%		7.4%	28.4%		7.4%	28.4%	28.4%
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	4.0
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	4.0	6.0		4.0	6.0		4.0	6.0		4.0	6.0	6.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	Yes
Recall Mode	None	Max		None	Max		None	None		None	None	None
Act Effect Green (s)	26.1	21.7		26.1	21.7		27.9	23.5		26.9	21.7	21.7
Actuated g/C Ratio	0.34	0.28		0.34	0.28		0.36	0.30		0.35	0.28	0.28
v/c Ratio	0.37	0.64		0.33	0.53		0.77	0.64		0.34	0.95	0.68
Control Delay	26.3	31.7		25.9	29.2		57.8	36.4		25.6	64.3	39.8
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	26.3	31.7		25.9	29.2		57.8	36.4		25.6	64.3	39.8
LOS	C	C		C	C		E	D		C	E	D
Approach Delay		30.9			28.7			42.6			51.6	
Approach LOS		C			C			D			D	
Queue Length 50th (ft)	23	98		18	81		31	109		24	174	94
Queue Length 95th (ft)	82	#242		67	189		#168	#333		68	#394	#215
Internal Link Dist (ft)		346			52			556			64	
Turn Bay Length (ft)	200						125			75		
Base Capacity (vph)	267	849		227	877		166	481		288	470	392
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0

Intersection Capacity Analysis
 Adams Street at Furnace Brook Parkway

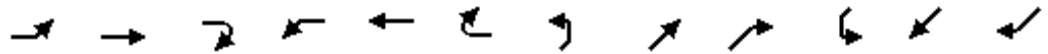
01/12/2021

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Right Turn on Red	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	15.0
Minimum Split (s)	27.0
Total Split (s)	27.0
Total Split (%)	28%
Yellow Time (s)	3.0
All-Red Time (s)	2.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	None
Act Effect Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	

Intersection Capacity Analysis

Adams Street at Furnace Brook Parkway

01/12/2021



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.37	0.64		0.33	0.53		0.77	0.64		0.34	0.95	0.68

Intersection Summary

Area Type: CBD

Cycle Length: 95

Actuated Cycle Length: 77.4

Natural Cycle: 95

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.95

Intersection Signal Delay: 39.4

Intersection LOS: D

Intersection Capacity Utilization 64.1%

ICU Level of Service C

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

















Splits and Phases: 3:

Ø1	Ø2	Ø3	Ø4	Ø9
7 s	27 s	7 s	27 s	27 s
Ø5	Ø6	Ø7	Ø8	
7 s	27 s	7 s	27 s	

HCM Unsignalized Intersection Capacity Analysis

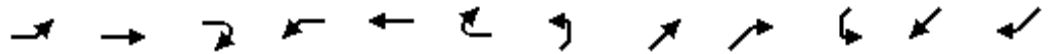
Adams Street at Common Street

01/12/2021

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	309	176	48	337	11	155	66	72	0	0	0
Future Volume (Veh/h)	0	309	176	48	337	11	155	66	72	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.86	0.86	0.86	0.82	0.82	0.82	0.92	0.92	0.92
Hourly flow rate (vph)	0	353	201	59	411	13	198	85	92	0	0	0
Pedestrians		1			1			15			1	
Lane Width (ft)		12.0			14.0			12.0			0.0	
Walking Speed (ft/s)		3.5			3.5			3.5			3.5	
Percent Blockage		0			0			1			0	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)		132										
pX, platoon unblocked				0.88			0.88	0.88	0.88	0.88	0.88	
vC, conflicting volume	425			569			793	1012	293	848	1106	214
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	425			237			492	740	0	555	847	214
tC, single (s)	4.2			4.2			7.6	6.6	7.0	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			95			47	69	90	100	100	100
cM capacity (veh/h)	1124			1145			373	277	931	239	245	790
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1						
Volume Total	235	319	59	274	150	375						
Volume Left	0	0	59	0	0	198						
Volume Right	0	201	0	0	13	92						
cSH	1700	1700	1145	1700	1700	401						
Volume to Capacity	0.14	0.19	0.05	0.16	0.09	0.94						
Queue Length 95th (ft)	0	0	4	0	0	259						
Control Delay (s)	0.0	0.0	8.3	0.0	0.0	62.7						
Lane LOS			A			F						
Approach Delay (s)	0.0		1.0			62.7						
Approach LOS						F						
Intersection Summary												
Average Delay			17.0									
Intersection Capacity Utilization			49.6%		ICU Level of Service				A			
Analysis Period (min)			15									

Intersection Capacity Analysis
 Adams Street at Furnace Brook Parkway

01/12/2021



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	141	500	114	34	422	0	143	253	88	67	297	139
Future Volume (vph)	141	500	114	34	422	0	143	253	88	67	297	139
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		0	0		0	125		0	100		0
Storage Lanes	1		0	1		0	1		0	1		1
Taper Length (ft)	170			25			25			25		
Right Turn on Red			No			No			No			No
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		438			132			636			144	
Travel Time (s)		10.0			3.0			14.5			3.3	
Confl. Peds. (#/hr)	27		17	17		27	22		14	14		22
Peak Hour Factor	0.91	0.91	0.91	0.87	0.87	0.87	0.94	0.94	0.94	0.91	0.91	0.91
Growth Factor	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	1%	1%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	164	715	0	41	514	0	161	384	0	78	346	162
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		8
Detector Phase	1	6		5	2		7	4		3	8	8
Switch Phase												
Minimum Initial (s)	3.0	5.0		3.0	5.0		3.0	5.0		3.0	1.0	1.0
Minimum Split (s)	7.0	27.0		7.0	27.0		7.0	27.0		7.0	27.0	27.0
Total Split (s)	7.0	27.0		7.0	27.0		7.0	27.0		7.0	27.0	27.0
Total Split (%)	7.4%	28.4%		7.4%	28.4%		7.4%	28.4%		7.4%	28.4%	28.4%
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	4.0
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	4.0	6.0		4.0	6.0		4.0	6.0		4.0	6.0	6.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	Yes
Recall Mode	None	Max		None	Max		None	None		None	None	None
Act Effect Green (s)	28.9	25.2		27.0	21.8		25.8	21.4		24.8	19.6	19.6
Actuated g/C Ratio	0.37	0.33		0.35	0.28		0.33	0.28		0.32	0.25	0.25
v/c Ratio	0.57	0.64		0.19	0.51		0.67	0.77		0.36	0.73	0.42
Control Delay	33.3	30.5		22.2	28.5		40.4	41.9		26.2	39.2	30.9
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	33.3	30.5		22.2	28.5		40.4	41.9		26.2	39.2	30.9
LOS	C	C		C	C		D	D		C	D	C
Approach Delay		31.0			28.0			41.5			35.1	
Approach LOS		C			C			D			D	
Queue Length 50th (ft)	40	135		9	90		39	139		18	121	52
Queue Length 95th (ft)	#165	#340		40	196		#171	#412		67	#345	149
Internal Link Dist (ft)		358			52			556			64	
Turn Bay Length (ft)	200						125			100		
Base Capacity (vph)	288	1111		216	999		239	506		218	530	432
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0

Intersection Capacity Analysis
 Adams Street at Furnace Brook Parkway

01/12/2021

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Right Turn on Red	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	15.0
Minimum Split (s)	27.0
Total Split (s)	27.0
Total Split (%)	28%
Yellow Time (s)	3.0
All-Red Time (s)	2.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	None
Act Effect Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	

Intersection Capacity Analysis
 Adams Street at Furnace Brook Parkway

01/12/2021



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.57	0.64		0.19	0.51		0.67	0.76		0.36	0.65	0.38

Intersection Summary

Area Type:	Other
Cycle Length:	95
Actuated Cycle Length:	77.1
Natural Cycle:	95
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.77
Intersection Signal Delay:	33.5
Intersection LOS:	C
Intersection Capacity Utilization	63.8%
ICU Level of Service	B
Analysis Period (min)	15
# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.	

Splits and Phases: 3:

Ø1	Ø2	Ø3	Ø4	Ø9
7 s	27 s	7 s	27 s	27 s
Ø5	Ø6	Ø7	Ø8	
7 s	27 s	7 s	27 s	

HCM Unsignalized Intersection Capacity Analysis

Adams Street at Common Street

01/12/2021



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↖	↑↑			↕				
Traffic Volume (veh/h)	0	413	248	43	325	7	130	84	45	0	0	0
Future Volume (Veh/h)	0	413	248	43	325	7	130	84	45	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.86	0.86	0.86	0.80	0.80	0.80	0.92	0.92	0.92
Hourly flow rate (vph)	0	497	299	53	401	9	172	111	60	0	0	0
Pedestrians		2			3			11			13	
Lane Width (ft)		12.0			14.0			12.0			0.0	
Walking Speed (ft/s)		3.5			3.5			3.5			3.5	
Percent Blockage		0			0			1			0	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)		132										
pX, platoon unblocked				0.83			0.83	0.83	0.83	0.83	0.83	
vC, conflicting volume	423			807			966	1186	412	892	1332	220
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	423			350			542	808	0	452	984	220
tC, single (s)	4.1			4.1			7.6	6.6	7.0	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			95			48	54	93	100	100	100
cM capacity (veh/h)	1133			993			328	241	882	231	192	782
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1						
Volume Total	331	465	53	267	143	343						
Volume Left	0	0	53	0	0	172						
Volume Right	0	299	0	0	9	60						
cSH	1700	1700	993	1700	1700	326						
Volume to Capacity	0.19	0.27	0.05	0.16	0.08	1.05						
Queue Length 95th (ft)	0	0	4	0	0	312						
Control Delay (s)	0.0	0.0	8.8	0.0	0.0	101.3						
Lane LOS			A			F						
Approach Delay (s)	0.0		1.0			101.3						
Approach LOS						F						
Intersection Summary												
Average Delay			22.0									
Intersection Capacity Utilization			53.5%		ICU Level of Service			A				
Analysis Period (min)			15									

Table I-3
Intersection Capacity Analysis
Alternative 2 under Projected 2030 AM and PM Peak-Hour Traffic Conditions

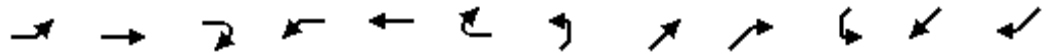
Intersection Approach	Lane Group	AM LOS	AM Delay	AM V/C	95th Queue	PM LOS	PM Delay	PM V/C	95th Queue
Adams Street EB	L	D	41	0.41	108	D	44	0.64	154
Adams Street EB	T/R	E	63	0.86	#324	D	52	0.83	#380
Adams Street WB	L	D	40	0.67	m#46	B	19	0.36	m25
Adams Street WB	T/R	B	17	0.41	m171	B	11	0.39	m173
Furnace Brook Parkway NB	L	E	76	0.73	#181	E	76	0.78	#220
Furnace Brook Parkway NB	T/R	D	48	0.66	322	D	55	0.79	#453
Furnace Brook Parkway SB	L	E	68	0.61	108	E	75	0.61	#121
Furnace Brook Parkway SB	T	E	72	0.93	#397	E	71	0.88	#443
Furnace Brook Parkway SB	R	C	21	0.50	94	C	21	0.37	96
Intersection (1) Average	-	D	49	-	-	D	46	-	-
Adams Street EB	T/R	A	2	0.24	m0	A	2	0.24	0
Adams Street WB	L	D	45	0.34	77	D	39	0.34	68
Adams Street WB	T/R	D	43	0.47	190	C	34	0.47	166
Common Street NB	L/T/R	E	67	0.89	#379	E	78	0.93	#354
Intersection (2) Average	-	C	33	-	-	C	27	-	-

Notes:

- Intersection: (1) Adams Street at Furnace Brook Parkway, (2) Adams Street at Common Street
- Approach: NB = Northbound, SB = Southbound, EB = Eastbound, WB = Westbound
- Turning movement: L = Left turn, T = Through movement, R = Right turn
- LOS = Level of Service
- Delay (seconds) = Average delay per vehicle
- V/C = Volume to capacity ratio
- 95th Queue (feet) = the maximum back of queue with 95th percentile traffic volumes.
- #: 95th percentile volume exceeds capacity. The queue shown is maximum after two cycles.
- m: Volume for 95th percentile queue is metered by upstream signal.

Intersection Capacity Analysis
Adams Street at Furnace Brook Parkway

01/12/2021



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	84	342	122	69	419	0	116	205	74	71	320	191
Future Volume (vph)	84	342	122	69	419	0	116	205	74	71	320	191
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		0	0		0	125		50	75		0
Storage Lanes	1		0	1		0	1		0	1		1
Taper Length (ft)	170			25			25			25		
Right Turn on Red			No			No			No			No
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		404			132			636			144	
Travel Time (s)		9.2			3.0			14.5			3.3	
Confl. Peds. (#/hr)	2		11	11		2	6		9	9		6
Peak Hour Factor	0.90	0.90	0.90	0.95	0.95	0.95	0.95	0.95	0.95	0.75	0.75	0.75
Growth Factor	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	3%	3%	3%	2%	2%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	98	541	0	76	463	0	128	309	0	99	448	267
Turn Type	pm+pt	NA		custom	NA		Prot	NA		Prot	NA	pt+ov
Protected Phases	5	2		1	6 10		3	8		7	4	4 5
Permitted Phases	2			6								
Detector Phase	5	2		1	6 10		3	8		7	4	4 5
Switch Phase												
Minimum Initial (s)	3.0	1.0		3.0			3.0	5.0		5.0	3.0	
Minimum Split (s)	7.0	8.0		7.0			7.0	30.0		9.5	30.0	
Total Split (s)	16.0	27.0		7.0			17.0	36.0		17.0	36.0	
Total Split (%)	13.3%	22.5%		5.8%			14.2%	30.0%		14.2%	30.0%	
Yellow Time (s)	3.0	4.0		3.0			3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	2.0		1.0			1.0	2.0		1.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0			0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	6.0		4.0			4.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lag		Lead			Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes			Yes	Yes		Yes	Yes	
Recall Mode	None	None		None			None	Max		None	None	
Act Effect Green (s)	30.0	22.4		17.5	39.5		12.0	31.9		11.1	31.0	40.4
Actuated g/C Ratio	0.25	0.19		0.15	0.33		0.10	0.27		0.09	0.26	0.34
v/c Ratio	0.41	0.86		0.67	0.41		0.73	0.66		0.61	0.93	0.50
Control Delay	41.4	62.9		40.1	13.3		76.2	47.8		67.8	71.7	20.6
Queue Delay	0.0	0.0		0.3	4.1		0.0	0.0		0.0	0.0	0.0
Total Delay	41.4	62.9		40.4	17.4		76.2	47.8		67.8	71.7	20.6
LOS	D	E		D	B		E	D		E	E	C
Approach Delay		59.6			20.7			56.1			54.5	
Approach LOS		E			C			E			D	
Queue Length 50th (ft)	61	219		31	128		97	216		74	344	78
Queue Length 95th (ft)	108	#324		m#46	m171		#181	322		108	#397	94
Internal Link Dist (ft)		324			52			556			64	
Turn Bay Length (ft)	200						125			75		
Base Capacity (vph)	244	626		114	1143		189	467		191	480	540
Starvation Cap Reductn	0	0		1	585		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0

Intersection Capacity Analysis
 Adams Street at Furnace Brook Parkway

01/12/2021

Lane Group	Ø6	Ø9	Ø10	Ø12	Ø13	Ø14
Lane Configurations						
Traffic Volume (vph)						
Future Volume (vph)						
Ideal Flow (vphpl)						
Storage Length (ft)						
Storage Lanes						
Taper Length (ft)						
Right Turn on Red						
Link Speed (mph)						
Link Distance (ft)						
Travel Time (s)						
Confl. Peds. (#/hr)						
Peak Hour Factor						
Growth Factor						
Heavy Vehicles (%)						
Shared Lane Traffic (%)						
Lane Group Flow (vph)						
Turn Type						
Protected Phases	6	9	10	12	13	14
Permitted Phases						
Detector Phase						
Switch Phase						
Minimum Initial (s)	2.5	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	8.5	27.0	28.0	22.5	22.0	22.5
Total Split (s)	18.0	33.0	33.0	53.0	34.0	34.0
Total Split (%)	15%	28%	28%	44%	28%	28%
Yellow Time (s)	4.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)						
Total Lost Time (s)						
Lead/Lag	Lag					
Lead-Lag Optimize?	Yes					
Recall Mode	C-Max	Max	None	None	None	None
Act Effect Green (s)						
Actuated g/C Ratio						
v/c Ratio						
Control Delay						
Queue Delay						
Total Delay						
LOS						
Approach Delay						
Approach LOS						
Queue Length 50th (ft)						
Queue Length 95th (ft)						
Internal Link Dist (ft)						
Turn Bay Length (ft)						
Base Capacity (vph)						
Starvation Cap Reductn						
Spillback Cap Reductn						

Intersection Capacity Analysis
 Adams Street at Furnace Brook Parkway

01/12/2021

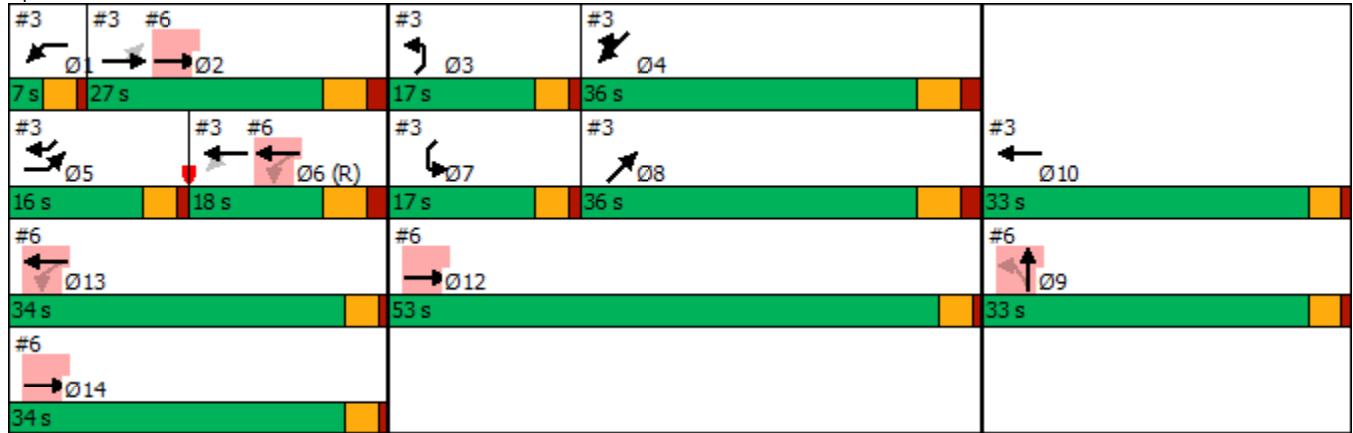


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.40	0.86		0.67	0.83		0.68	0.66		0.52	0.93	0.49

Intersection Summary

Area Type: Other
 Cycle Length: 120
 Actuated Cycle Length: 120
 Offset: 0 (0%), Referenced to phase 6:WBTL, Start of Green
 Natural Cycle: 90
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.93
 Intersection Signal Delay: 48.6 Intersection LOS: D
 Intersection Capacity Utilization 59.8% ICU Level of Service B
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3:



Intersection Capacity Analysis
Adams Street at Common Street

01/12/2021



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↖	↑↑			↕				
Traffic Volume (vph)	0	309	176	48	337	11	155	66	72	0	0	0
Future Volume (vph)	0	309	176	48	337	11	155	66	72	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	15	12	12	12	12	12	12	12
Storage Length (ft)	0		0	150		0	0		50	0		0
Storage Lanes	0		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30				30
Link Distance (ft)		132			254			588				156
Travel Time (s)		3.0			5.8			13.4				3.5
Confl. Peds. (#/hr)	1		15	15		1	1		1			
Peak Hour Factor	0.92	0.92	0.92	0.86	0.86	0.86	0.82	0.82	0.82	0.92	0.92	0.92
Growth Factor	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	5%	5%	5%	2%	2%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	554	0	59	424	0	0	375	0	0	0	0
Turn Type		NA		Perm	NA		Perm	NA				
Protected Phases		2 12 14			6 13			9				
Permitted Phases				6 13			9					
Detector Phase		2 12 14		6 13	6 13		9	9				
Switch Phase												
Minimum Initial (s)							5.0	5.0				
Minimum Split (s)							27.0	27.0				
Total Split (s)							33.0	33.0				
Total Split (%)							27.5%	27.5%				
Yellow Time (s)							3.0	3.0				
All-Red Time (s)							1.0	1.0				
Lost Time Adjust (s)								0.0				
Total Lost Time (s)								4.0				
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode							Max	Max				
Act Effect Green (s)		81.0		28.0	28.0			29.0				
Actuated g/C Ratio		0.68		0.23	0.23			0.24				
v/c Ratio		0.24		0.34	0.47			0.89				
Control Delay		0.2		44.7	41.5			67.0				
Queue Delay		1.4		0.0	1.3			0.0				
Total Delay		1.6		44.7	42.8			67.0				
LOS		A		D	D			E				
Approach Delay		1.6			43.0			67.0				
Approach LOS		A			D			E				
Queue Length 50th (ft)		0		38	148			273				
Queue Length 95th (ft)		m0		77	190			#379				
Internal Link Dist (ft)		52			174			508				76
Turn Bay Length (ft)				150								
Base Capacity (vph)		2277		176	895			420				
Starvation Cap Reductn		1479		0	0			0				

Intersection Capacity Analysis

Adams Street at Common Street

01/12/2021

Lane Group	Ø1	Ø2	Ø3	Ø4	Ø5	Ø6	Ø7	Ø8	Ø10	Ø12	Ø13	Ø14
Lane Configurations												
Traffic Volume (vph)												
Future Volume (vph)												
Ideal Flow (vphpl)												
Lane Width (ft)												
Storage Length (ft)												
Storage Lanes												
Taper Length (ft)												
Right Turn on Red												
Link Speed (mph)												
Link Distance (ft)												
Travel Time (s)												
Confl. Peds. (#/hr)												
Peak Hour Factor												
Growth Factor												
Heavy Vehicles (%)												
Shared Lane Traffic (%)												
Lane Group Flow (vph)												
Turn Type												
Protected Phases	1	2	3	4	5	6	7	8	10	12	13	14
Permitted Phases												
Detector Phase												
Switch Phase												
Minimum Initial (s)	3.0	1.0	3.0	3.0	3.0	2.5	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	7.0	8.0	7.0	30.0	7.0	8.5	9.5	30.0	28.0	22.5	22.0	22.5
Total Split (s)	7.0	27.0	17.0	36.0	16.0	18.0	17.0	36.0	33.0	53.0	34.0	34.0
Total Split (%)	6%	23%	14%	30%	13%	15%	14%	30%	28%	44%	28%	28%
Yellow Time (s)	3.0	4.0	3.0	4.0	3.0	4.0	3.0	4.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	2.0	1.0	2.0	1.0	2.0	1.0	2.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)												
Total Lost Time (s)												
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag				
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes				
Recall Mode	None	None	None	None	None	C-Max	None	Max	None	None	None	None
Act Effect Green (s)												
Actuated g/C Ratio												
v/c Ratio												
Control Delay												
Queue Delay												
Total Delay												
LOS												
Approach Delay												
Approach LOS												
Queue Length 50th (ft)												
Queue Length 95th (ft)												
Internal Link Dist (ft)												
Turn Bay Length (ft)												
Base Capacity (vph)												
Starvation Cap Reductn												

Intersection Capacity Analysis
 Adams Street at Common Street

01/12/2021

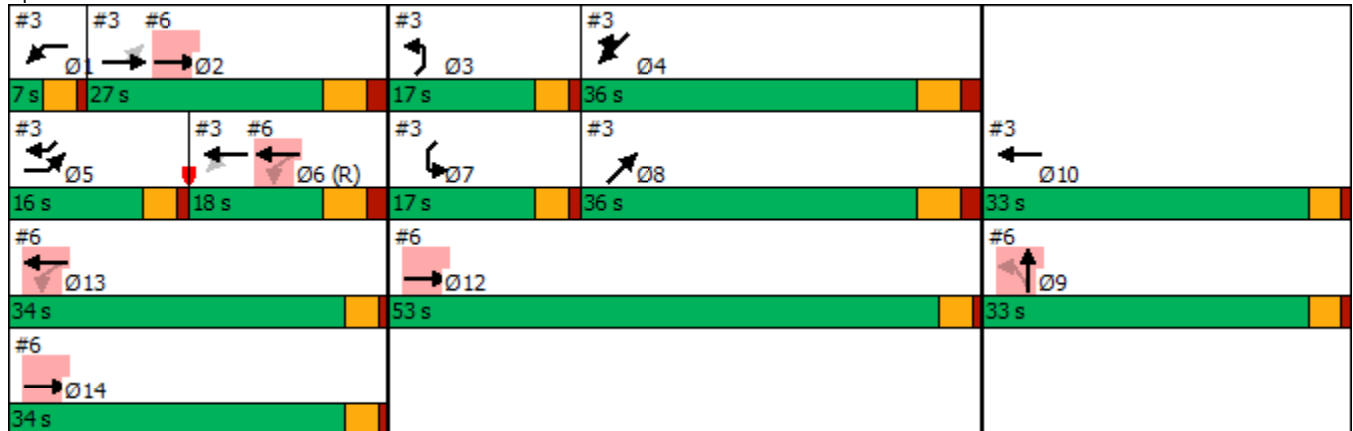


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Spillback Cap Reductn		0		0	272			0				
Storage Cap Reductn		0		0	0			0				
Reduced v/c Ratio		0.69		0.34	0.68			0.89				

Intersection Summary

Area Type:	Other
Cycle Length:	120
Actuated Cycle Length:	120
Offset:	0 (0%), Referenced to phase 6:WBTL, Start of Green
Natural Cycle:	90
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.93
Intersection Signal Delay:	33.2
Intersection LOS:	C
Intersection Capacity Utilization	49.4%
ICU Level of Service	A
Analysis Period (min)	15
#	95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.
m	Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6:



Intersection Capacity Analysis

Adams Street at Furnace Brook Parkway

01/12/2021



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	141	500	114	34	422	0	143	253	88	67	297	139
Future Volume (vph)	141	500	114	34	422	0	143	253	88	67	297	139
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		0	0		0	125		50	75		0
Storage Lanes	1		0	1		0	1		0	1		1
Taper Length (ft)	170			25			25			25		
Right Turn on Red			No			No			No			No
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		404			132			636			144	
Travel Time (s)		9.2			3.0			14.5			3.3	
Confl. Peds. (#/hr)	27		17	17		27	22		14	14		22
Peak Hour Factor	0.91	0.91	0.91	0.87	0.87	0.87	0.94	0.94	0.94	0.91	0.91	0.91
Growth Factor	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	1%	1%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	164	715	0	41	514	0	161	384	0	78	346	162
Turn Type	pm+pt	NA		custom	NA		Prot	NA		Prot	NA	pt+ov
Protected Phases	5	2		1	6 10		3	8		7	4	4 5
Permitted Phases	2			6								
Detector Phase	5	2		1	6 10		3	8		7	4	4 5
Switch Phase												
Minimum Initial (s)	3.0	1.0		3.0			3.0	5.0		5.0	3.0	
Minimum Split (s)	7.0	8.0		7.0			7.0	30.0		9.5	30.0	
Total Split (s)	14.0	35.0		7.0			19.0	36.0		13.0	30.0	
Total Split (%)	11.7%	29.2%		5.8%			15.8%	30.0%		10.8%	25.0%	
Maximum Green (s)	10.0	29.0		3.0			15.0	30.0		9.0	24.0	
Yellow Time (s)	3.0	4.0		3.0			3.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	2.0		1.0			1.0	2.0		1.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0			0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	6.0		4.0			4.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lag		Lead			Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes			Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0			3.0	3.0		3.0	3.0	
Recall Mode	None	None		None			None	Max		None	None	
Walk Time (s)								7.0			7.0	
Flash Dont Walk (s)								17.0			17.0	
Pedestrian Calls (#/hr)								20			20	
Act Effct Green (s)	38.0	30.4		27.2	45.2		13.9	32.6		8.5	25.1	32.9
Actuated g/C Ratio	0.32	0.25		0.23	0.38		0.12	0.27		0.07	0.21	0.27
v/c Ratio	0.64	0.83		0.36	0.39		0.78	0.79		0.61	0.88	0.37
Control Delay	43.6	52.3		19.2	9.3		76.2	54.6		74.8	70.6	21.2
Queue Delay	0.0	0.0		0.2	1.5		0.0	0.0		0.0	0.0	0.0
Total Delay	43.6	52.3		19.3	10.8		76.2	54.6		74.8	70.6	21.2
LOS	D	D		B	B		E	D		E	E	C
Approach Delay		50.7			11.5			61.0			57.5	
Approach LOS		D			B			E			E	
Queue Length 50th (ft)	95	281		11	140		122	285		60	265	59
Queue Length 95th (ft)	154	#380		m25	m173		#220	#453		#121	#443	96

Intersection Capacity Analysis
 Adams Street at Furnace Brook Parkway

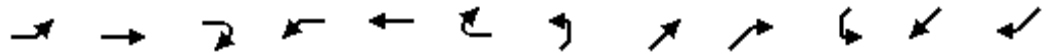
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Lane Group	Ø6	Ø9	Ø10	Ø12	Ø13	Ø14
Lane Configurations						
Traffic Volume (vph)						
Future Volume (vph)						
Ideal Flow (vphpl)						
Storage Length (ft)						
Storage Lanes						
Taper Length (ft)						
Right Turn on Red						
Link Speed (mph)						
Link Distance (ft)						
Travel Time (s)						
Confl. Peds. (#/hr)						
Peak Hour Factor						
Growth Factor						
Heavy Vehicles (%)						
Shared Lane Traffic (%)						
Lane Group Flow (vph)						
Turn Type						
Protected Phases	6	9	10	12	13	14
Permitted Phases						
Detector Phase						
Switch Phase						
Minimum Initial (s)	2.5	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	8.5	27.0	28.0	22.5	22.0	22.5
Total Split (s)	28.0	29.0	29.0	49.0	42.0	42.0
Total Split (%)	23%	24%	24%	41%	35%	35%
Maximum Green (s)	22.0	25.0	25.0	45.0	38.0	38.0
Yellow Time (s)	4.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)						
Total Lost Time (s)						
Lead/Lag		Lag				
Lead-Lag Optimize?		Yes				
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	Max	None	None	None	None
Walk Time (s)			7.0			
Flash Dont Walk (s)			17.0			
Pedestrian Calls (#/hr)			20			
Act Effct Green (s)						
Actuated g/C Ratio						
v/c Ratio						
Control Delay						
Queue Delay						
Total Delay						
LOS						
Approach Delay						
Approach LOS						
Queue Length 50th (ft)						
Queue Length 95th (ft)						

Intersection Capacity Analysis

Adams Street at Furnace Brook Parkway

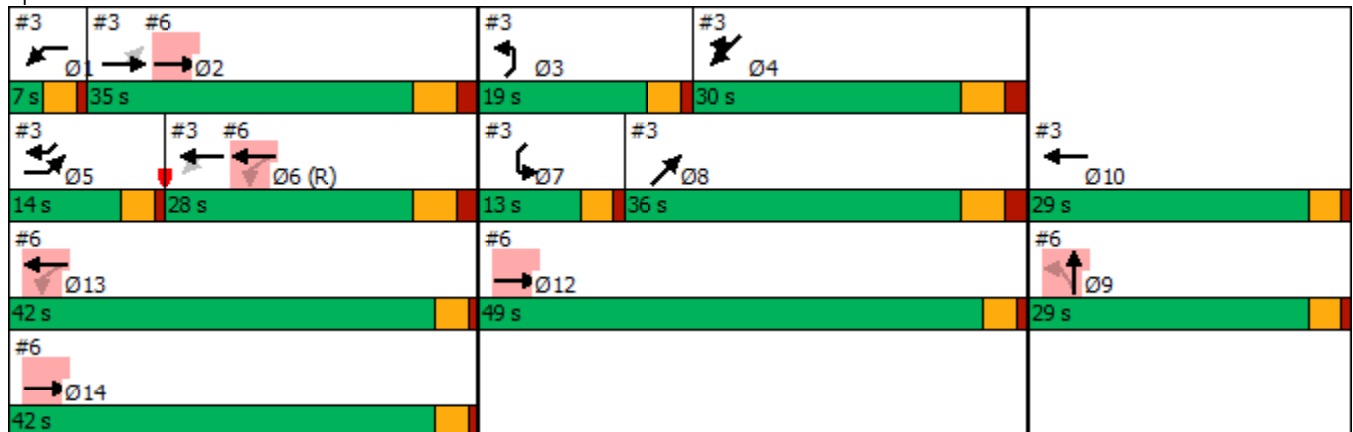
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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Internal Link Dist (ft)		324			52			556			64	
Turn Bay Length (ft)	200						125			75		
Base Capacity (vph)	259	862		115	1333		223	487		134	393	440
Starvation Cap Reductn	0	0		3	608		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.63	0.83		0.37	0.71		0.72	0.79		0.58	0.88	0.37

Intersection Summary	
Area Type:	Other
Cycle Length:	120
Actuated Cycle Length:	120
Offset:	0 (0%), Referenced to phase 6:WBTL, Start of Green
Natural Cycle:	100
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.93
Intersection Signal Delay:	45.9
Intersection LOS:	D
Intersection Capacity Utilization:	65.6%
ICU Level of Service:	C
Analysis Period (min):	15
#	95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.
m	Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3:



Intersection Capacity Analysis

Adams Street at Common Street

01/12/2021



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↖	↑↑			↑↓				
Traffic Volume (vph)	0	413	248	43	325	7	130	84	45	0	0	0
Future Volume (vph)	0	413	248	43	325	7	130	84	45	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	15	12	12	12	12	12	12	12
Storage Length (ft)	0		0	200		0	0		50	0		0
Storage Lanes	0		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30				30
Link Distance (ft)		132			281			588				156
Travel Time (s)		3.0			6.4			13.4				3.5
Confl. Peds. (#/hr)	13		11	11		13	2		3			
Peak Hour Factor	0.88	0.88	0.88	0.86	0.86	0.86	0.80	0.80	0.80	0.92	0.92	0.92
Growth Factor	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	3%	3%	3%	2%	2%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	796	0	53	410	0	0	343	0	0	0	0
Turn Type		NA		Perm	NA		Perm	NA				
Protected Phases		2 12 14			6 13			9				
Permitted Phases				6 13			9					
Detector Phase		2 12 14		6 13	6 13		9	9				
Switch Phase												
Minimum Initial (s)							5.0	5.0				
Minimum Split (s)							27.0	27.0				
Total Split (s)							29.0	29.0				
Total Split (%)							24.2%	24.2%				
Maximum Green (s)							25.0	25.0				
Yellow Time (s)							3.0	3.0				
All-Red Time (s)							1.0	1.0				
Lost Time Adjust (s)								0.0				
Total Lost Time (s)								4.0				
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)							3.0	3.0				
Recall Mode							Max	Max				
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		85.0		36.0	36.0			25.0				
Actuated g/C Ratio		0.71		0.30	0.30			0.21				
v/c Ratio		0.33		0.32	0.35			0.93				
Control Delay		0.2		38.9	33.7			77.6				
Queue Delay		1.5		0.0	0.2			0.0				
Total Delay		1.7		38.9	33.9			77.6				
LOS		A		D	C			E				
Approach Delay		1.7			34.5			77.6				
Approach LOS		A			C			E				
Queue Length 50th (ft)		0		32	130			257				

Intersection Capacity Analysis

Adams Street at Common Street

01/12/2021

Lane Group	Ø1	Ø2	Ø3	Ø4	Ø5	Ø6	Ø7	Ø8	Ø10	Ø12	Ø13	Ø14
Lane Configurations												
Traffic Volume (vph)												
Future Volume (vph)												
Ideal Flow (vphpl)												
Lane Width (ft)												
Storage Length (ft)												
Storage Lanes												
Taper Length (ft)												
Right Turn on Red												
Link Speed (mph)												
Link Distance (ft)												
Travel Time (s)												
Confl. Peds. (#/hr)												
Peak Hour Factor												
Growth Factor												
Heavy Vehicles (%)												
Shared Lane Traffic (%)												
Lane Group Flow (vph)												
Turn Type												
Protected Phases	1	2	3	4	5	6	7	8	10	12	13	14
Permitted Phases												
Detector Phase												
Switch Phase												
Minimum Initial (s)	3.0	1.0	3.0	3.0	3.0	2.5	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	7.0	8.0	7.0	30.0	7.0	8.5	9.5	30.0	28.0	22.5	22.0	22.5
Total Split (s)	7.0	35.0	19.0	30.0	14.0	28.0	13.0	36.0	29.0	49.0	42.0	42.0
Total Split (%)	6%	29%	16%	25%	12%	23%	11%	30%	24%	41%	35%	35%
Maximum Green (s)	3.0	29.0	15.0	24.0	10.0	22.0	9.0	30.0	25.0	45.0	38.0	38.0
Yellow Time (s)	3.0	4.0	3.0	4.0	3.0	4.0	3.0	4.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	2.0	1.0	2.0	1.0	2.0	1.0	2.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)												
Total Lost Time (s)												
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag				
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes				
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	C-Max	None	Max	None	None	None	None
Walk Time (s)				7.0				7.0	7.0			
Flash Dont Walk (s)				17.0				17.0	17.0			
Pedestrian Calls (#/hr)				20				20	20			
Act Effct Green (s)												
Actuated g/C Ratio												
v/c Ratio												
Control Delay												
Queue Delay												
Total Delay												
LOS												
Approach Delay												
Approach LOS												
Queue Length 50th (ft)												

Intersection Capacity Analysis Adams Street at Common Street

01/12/2021



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)		0		68	166			#354				
Internal Link Dist (ft)		52			201			508			76	
Turn Bay Length (ft)				200								
Base Capacity (vph)		2416		168	1176			370				
Starvation Cap Reductn		1363		0	0			0				
Spillback Cap Reductn		0		0	257			0				
Storage Cap Reductn		0		0	0			0				
Reduced v/c Ratio		0.76		0.32	0.45			0.93				

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 6:WBTL, Start of Green

Natural Cycle: 100

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.93

Intersection Signal Delay: 27.4

Intersection LOS: C

Intersection Capacity Utilization 52.9%

ICU Level of Service A

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 6:

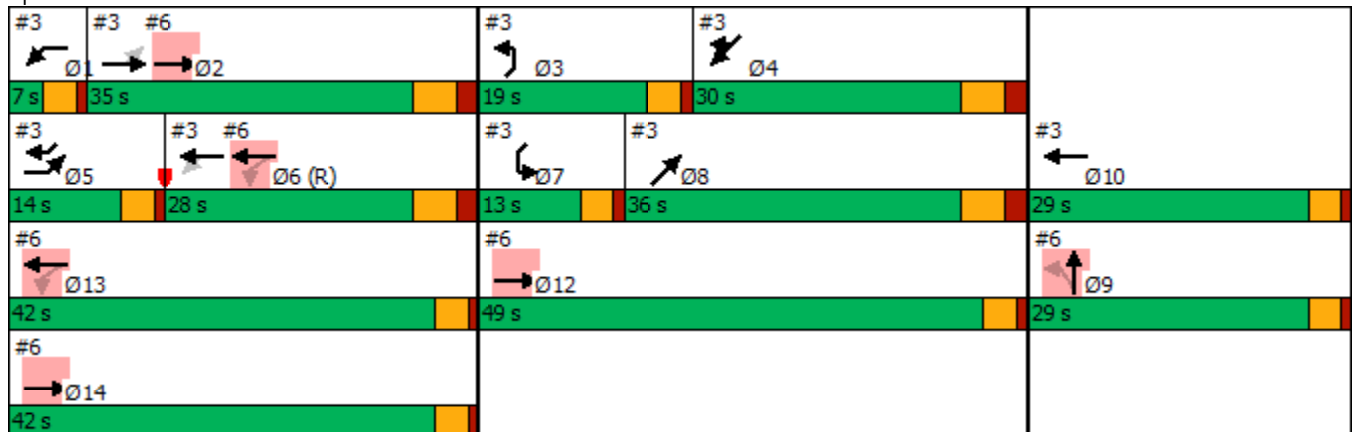


Table I-4
Intersection Capacity Analysis
Alternative 3 under Projected 2030 AM and PM Peak-Hour Traffic Conditions

Intersection Approach	Lane Group	AM LOS	AM Delay	AM V/C	95th Queue	PM LOS	PM Delay	PM V/C	95th Queue
Adams Street EB	L	C	26	0.36	108	C	34	0.55	#157
Adams Street EB	T/R	D	51	0.79	#336	D	39	0.75	#383
Adams Street WB	L	D	51	0.68	#177	D	35	0.50	#91
Adams Street WB	T/R	D	42	0.51	192	C	32	0.46	178
Furnace Brook Parkway NB	L	D	50	0.88	#334	D	43	0.83	#292
Furnace Brook Parkway NB	T/R	C	33	0.60	384	D	39	0.77	#520
Furnace Brook Parkway SB	L	C	23	0.29	69	C	28	0.37	68
Furnace Brook Parkway SB	T	D	54	0.86	#417	D	50	0.80	#400
Furnace Brook Parkway SB	R	D	41	0.61	233	C	37	0.46	167
Intersection (1) Average	-	D	45	-	-	D	39	-	-
Adams Street EB	T/R	A	0	0.19	-	A	0	0.27	-
Adams Street WB	T	A	0	0.15	-	A	0	0.14	-
Common Street NB	R	A	9	0.12	11	A	9	0.09	7
Intersection (2) Average	-	A	1	-	-	A	1	-	-

Notes:

- Intersection: (1) Adams Street at Furnace Brook Parkway, (2) Adams Street at Common Street
- Approach: NB = Northbound, SB = Southbound, EB = Eastbound, WB = Westbound
- Turning movement: L = Left turn, T = Through movement, R = Right turn
- LOS = Level of Service
- Delay (seconds) = Average delay per vehicle
- V/C = Volume to capacity ratio
- 95th Queue (feet) = the maximum back of queue with 95th percentile traffic volumes.
- #: 95th percentile volume exceeds capacity. The queue shown is maximum after two cycles.

Intersection Capacity Analysis
 Adams Street at Furnace Brook Parkway

01/13/2021



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	84	342	122	117	311	11	255	271	74	71	320	191
Future Volume (vph)	84	342	122	117	311	11	255	271	74	71	320	191
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		0	0		0	250		0	75		150
Storage Lanes	1		0	1		0	1		0	1		1
Taper Length (ft)	170			25			25			25		
Right Turn on Red			No			No			No			No
Link Speed (mph)		30			30			30				30
Link Distance (ft)		426			132			636				294
Travel Time (s)		9.7			3.0			14.5				6.7
Confl. Peds. (#/hr)	2		11	11		2	6		9	9		6
Peak Hour Factor	0.90	0.90	0.90	0.95	0.95	0.95	0.95	0.95	0.95	0.75	0.75	0.75
Growth Factor	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	3%	3%	3%	2%	2%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	98	541	0	129	356	0	282	382	0	99	448	267
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		8
Detector Phase	1	6		5	2		7	4		3	8	8
Switch Phase												
Minimum Initial (s)	3.0	5.0		3.0	5.0		3.0	5.0		3.0	5.0	5.0
Minimum Split (s)	7.0	27.0		7.0	27.0		7.0	27.0		7.0	27.0	27.0
Total Split (s)	10.0	30.0		10.0	30.0		18.0	49.0		9.0	40.0	40.0
Total Split (%)	8.0%	24.0%		8.0%	24.0%		14.4%	39.2%		7.2%	32.0%	32.0%
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	4.0
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	4.0	6.0		4.0	6.0		4.0	6.0		4.0	6.0	6.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	Yes
Recall Mode	None	Max		None	Max		None	None		None	None	None
Act Effect Green (s)	32.5	24.4		32.5	24.4		54.1	43.0		40.9	33.8	33.8
Actuated g/C Ratio	0.30	0.23		0.30	0.23		0.50	0.40		0.38	0.31	0.31
v/c Ratio	0.36	0.79		0.68	0.51		0.88	0.60		0.29	0.86	0.61
Control Delay	34.2	51.2		50.9	41.9		49.7	33.3		22.6	54.0	41.4
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	34.2	51.2		50.9	41.9		49.7	33.3		22.6	54.0	41.4
LOS	C	D		D	D		D	C		C	D	D
Approach Delay		48.6			44.3			40.2			46.0	
Approach LOS		D			D			D			D	
Queue Length 50th (ft)	41	163		55	100		91	171		28	246	133
Queue Length 95th (ft)	108	#336		#177	192		#334	384		69	#417	233
Internal Link Dist (ft)		346			52			556			214	
Turn Bay Length (ft)	200						250			75		150
Base Capacity (vph)	272	681		191	700		322	646		341	535	446
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0

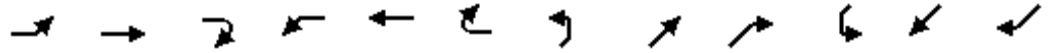
Intersection Capacity Analysis
 Adams Street at Furnace Brook Parkway

01/13/2021

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Right Turn on Red	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	15.0
Minimum Split (s)	27.0
Total Split (s)	27.0
Total Split (%)	22%
Yellow Time (s)	3.0
All-Red Time (s)	2.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	None
Act Effect Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	

Intersection Capacity Analysis
 Adams Street at Furnace Brook Parkway

01/13/2021



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.36	0.79		0.68	0.51		0.88	0.59		0.29	0.84	0.60

Intersection Summary

Area Type:	CBD
Cycle Length:	125
Actuated Cycle Length:	108.2
Natural Cycle:	125
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.88
Intersection Signal Delay:	44.9
Intersection LOS:	D
Intersection Capacity Utilization	76.2%
ICU Level of Service	D
Analysis Period (min)	15
# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.	

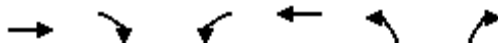
Splits and Phases: 3:

Ø1	Ø2	Ø3	Ø4	Ø9
10 s	30 s	9 s	49 s	27 s
Ø5	Ø6	Ø7	Ø8	
10 s	30 s	18 s	40 s	

HCM Unsignalized Intersection Capacity Analysis

Adams Street at Common Street

01/13/2021



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑		↗
Traffic Volume (veh/h)	309	176	0	428	0	88
Future Volume (Veh/h)	309	176	0	428	0	88
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.86	0.86	0.82	0.82
Hourly flow rate (vph)	353	201	0	523	0	113
Pedestrians	1			1	15	
Lane Width (ft)	12.0			15.0	12.0	
Walking Speed (ft/s)	3.5			3.5	3.5	
Percent Blockage	0			0	1	
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)	132					
pX, platoon unblocked			0.86		0.86	0.86
vC, conflicting volume			569		731	293
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			172		360	0
tC, single (s)			4.2		6.9	7.0
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	88
cM capacity (veh/h)			1182		511	909
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	235	319	262	262	113	
Volume Left	0	0	0	0	0	
Volume Right	0	201	0	0	113	
cSH	1700	1700	1700	1700	909	
Volume to Capacity	0.14	0.19	0.15	0.15	0.12	
Queue Length 95th (ft)	0	0	0	0	11	
Control Delay (s)	0.0	0.0	0.0	0.0	9.5	
Lane LOS						A
Approach Delay (s)	0.0		0.0		9.5	
Approach LOS						A
Intersection Summary						
Average Delay			0.9			
Intersection Capacity Utilization			30.4%	ICU Level of Service	A	
Analysis Period (min)			15			

Intersection Capacity Analysis
 Adams Street at Furnace Brook Parkway

01/13/2021



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	141	500	114	77	338	7	260	337	88	67	297	139
Future Volume (vph)	141	500	114	77	338	7	260	337	88	67	297	139
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		0	0		0	250		0	75		150
Storage Lanes	1		0	1		0	1		0	1		1
Taper Length (ft)	170			25			25			25		
Right Turn on Red			No			No			No			No
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		438			132			636			284	
Travel Time (s)		10.0			3.0			14.5			6.5	
Confl. Peds. (#/hr)	27		17	17		27	22		14	14		22
Peak Hour Factor	0.91	0.91	0.91	0.87	0.87	0.87	0.94	0.94	0.94	0.91	0.91	0.91
Growth Factor	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%	106%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	1%	1%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	164	715	0	94	421	0	293	479	0	78	346	162
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		8
Detector Phase	1	6		5	2		7	4		3	8	8
Switch Phase												
Minimum Initial (s)	3.0	5.0		3.0	5.0		3.0	5.0		3.0	1.0	1.0
Minimum Split (s)	7.0	27.0		7.0	27.0		7.0	27.0		7.0	27.0	27.0
Total Split (s)	8.0	28.0		8.0	28.0		15.0	35.0		7.0	27.0	27.0
Total Split (%)	7.6%	26.7%		7.6%	26.7%		14.3%	33.3%		6.7%	25.7%	25.7%
Yellow Time (s)	3.0	4.0		3.0	4.0		3.0	4.0		3.0	4.0	4.0
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	4.0	6.0		4.0	6.0		4.0	6.0		4.0	6.0	6.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	Yes
Recall Mode	None	Max		None	Max		None	None		None	None	None
Act Effect Green (s)	29.7	24.5		28.7	22.6		37.5	30.0		25.2	20.1	20.1
Actuated g/C Ratio	0.34	0.28		0.33	0.26		0.43	0.34		0.29	0.23	0.23
v/c Ratio	0.55	0.75		0.50	0.46		0.83	0.77		0.37	0.80	0.46
Control Delay	33.8	38.5		35.1	32.0		43.4	39.4		28.1	50.0	37.1
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	33.8	38.5		35.1	32.0		43.4	39.4		28.1	50.0	37.1
LOS	C	D		D	C		D	D		C	D	D
Approach Delay		37.6			32.6			40.9			43.5	
Approach LOS		D			C			D			D	
Queue Length 50th (ft)	50	165		28	87		83	194		19	150	64
Queue Length 95th (ft)	#157	#383		#91	178		#292	#520		68	#400	167
Internal Link Dist (ft)		358			52			556			204	
Turn Bay Length (ft)	200						250			75		150
Base Capacity (vph)	300	951		188	907		355	626		209	462	375
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0

Intersection Capacity Analysis
 Adams Street at Furnace Brook Parkway

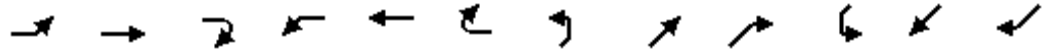
01/13/2021

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Right Turn on Red	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	15.0
Minimum Split (s)	27.0
Total Split (s)	27.0
Total Split (%)	26%
Yellow Time (s)	3.0
All-Red Time (s)	2.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	None
Act Effect Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	

Intersection Capacity Analysis

Adams Street at Furnace Brook Parkway

01/13/2021

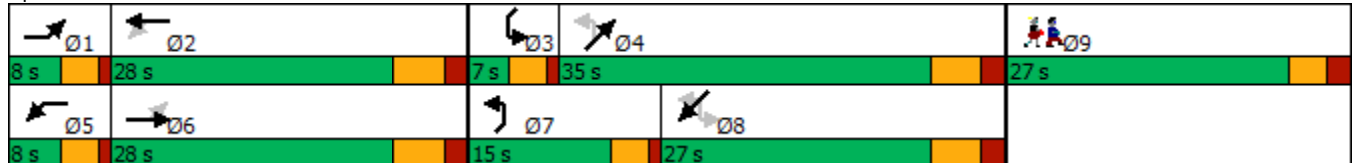


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.55	0.75		0.50	0.46		0.83	0.77		0.37	0.75	0.43

Intersection Summary

Area Type:	Other
Cycle Length:	105
Actuated Cycle Length:	87.6
Natural Cycle:	105
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.83
Intersection Signal Delay:	38.9
Intersection LOS:	D
Intersection Capacity Utilization	71.8%
ICU Level of Service	C
Analysis Period (min)	15
# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.	

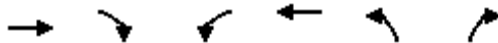
Splits and Phases: 3:



HCM Unsignalized Intersection Capacity Analysis

Adams Street at Common Street

01/13/2021



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑		↗
Traffic Volume (veh/h)	413	248	0	388	0	58
Future Volume (Veh/h)	413	248	0	388	0	58
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.86	0.86	0.80	0.80
Hourly flow rate (vph)	497	299	0	478	0	77
Pedestrians	2			3	11	
Lane Width (ft)	12.0			15.0	12.0	
Walking Speed (ft/s)	3.5			3.5	3.5	
Percent Blockage	0			0	1	
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)	132					
pX, platoon unblocked				0.82	0.82	0.82
vC, conflicting volume				807	898	412
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol				311	424	0
tC, single (s)				4.1	6.9	7.0
tC, 2 stage (s)						
tF (s)				2.2	3.5	3.3
p0 queue free %				100	100	91
cM capacity (veh/h)				1011	448	869
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	331	465	239	239	77	
Volume Left	0	0	0	0	0	
Volume Right	0	299	0	0	77	
cSH	1700	1700	1700	1700	869	
Volume to Capacity	0.19	0.27	0.14	0.14	0.09	
Queue Length 95th (ft)	0	0	0	0	7	
Control Delay (s)	0.0	0.0	0.0	0.0	9.5	
Lane LOS						A
Approach Delay (s)	0.0		0.0		9.5	
Approach LOS						A
Intersection Summary						
Average Delay				0.5		
Intersection Capacity Utilization				35.3%	ICU Level of Service	A
Analysis Period (min)				15		

Table I-5
Intersection Capacity Analysis
Alternative 4 under Projected 2030 AM and PM Peak-Hour Traffic Conditions

Intersection Approach	Lane Group	AM LOS	AM Delay	AM V/C	95th Queue	PM LOS	PM Delay	PM V/C	95th Queue
Adams Street EB	L/T	B	13	0.52	75	C	17	0.68	125
Adams Street EB	T/R	A	9	0.36	50	A	9	0.40	50
Adams Street WB	L/T	B	10	0.34	25	B	12	0.37	50
Adams Street WB	T/R	A	9	0.34	50	B	11	0.37	50
Furnace Brook Parkway NB	L	A	7	0.18	25	B	10	0.28	25
Furnace Brook Parkway NB	T/R	A	10	0.40	50	C	17	0.60	100
Furnace Brook Parkway SB	L/T	C	17	0.61	100	B	12	0.43	50
Furnace Brook Parkway SB	T/R	C	16	0.61	100	B	11	0.44	50
Common Street NWB	L/T	C	15	0.56	100	C	23	0.67	125
Intersection Average	-	B	13	-	-	B	14	-	-

Notes:

- This double-lane roundabout alternative contains five approaches from Adams Street, Furnace Brook Parkway, and Common Street.
- The right-turn from Common Street to Adams Street is separated from the roundabout (see Figure 7).
- The analysis is summarized from Synchro roundabout reports based on Highway Capacity Manual 6th Version.
- Approach: NB = Northbound, SB = Southbound, EB = Eastbound, WB = Westbound, NWB = Northwest bound
- Turning movement: L = Left turn, T = Through movement, R = Right turn
- LOS = Level of Service
- Delay (seconds) = Average delay per vehicle
- V/C = Volume to capacity ratio
- 95th Queue (feet) = the estimated length of queueing vehicles (25 feet per vehicle) with 95th percentile traffic volumes.

HCM 6th Roundabout
 Adams Street at Furnace Brook Parkway and Common Street

01/13/2021

Intersection								
Intersection Delay, s/veh	12.8							
Intersection LOS	B							
Approach	EB		WB		NW		NE	
Entry Lanes	2		2		1		2	
Conflicting Circle Lanes	2		2		2		2	
Adj Approach Flow, veh/h	639		460		375		437	
Demand Flow Rate, veh/h	652		477		394		450	
Vehicles Circulating, veh/h	692		763		833		663	
Vehicles Exiting, veh/h	944		464		280		681	
Ped Vol Crossing Leg, #/h	6		15		15		15	
Ped Cap Adj	0.998		0.996		0.998		0.994	
Approach Delay, s/veh	11.5		9.7		15.0		8.9	
Approach LOS	B		A		C		A	
Lane	Left	Right	Left	Right	Left	Left	Right	
Designated Moves	LT	R	LT	TR	LR	L	TR	
Assumed Moves	LT	R	LT	TR	LR	L	TR	
RT Channelized								
Lane Util	0.572	0.428	0.470	0.530	1.000	0.293	0.707	
Follow-Up Headway, s	2.667	2.535	2.667	2.535	2.535	2.667	2.535	
Critical Headway, s	4.645	4.328	4.645	4.328	4.328	4.645	4.328	
Entry Flow, veh/h	373	279	224	253	394	132	318	
Cap Entry Lane, veh/h	714	789	669	742	699	734	808	
Entry HV Adj Factor	0.980	0.978	0.966	0.964	0.952	0.970	0.972	
Flow Entry, veh/h	366	273	216	244	375	128	309	
Cap Entry, veh/h	699	770	643	713	664	707	781	
V/C Ratio	0.523	0.355	0.336	0.342	0.564	0.181	0.396	
Control Delay, s/veh	13.3	9.0	10.1	9.4	15.0	7.1	9.6	
LOS	B	A	B	A	C	A	A	
95th %tile Queue, veh	3	2	1	2	4	1	2	

HCM 6th Roundabout
 Adams Street at Furnace Brook Parkway and Common Street

01/13/2021

Intersection		
Intersection Delay, s/veh		
Intersection LOS		
Approach	SW	
Entry Lanes	2	
Conflicting Circle Lanes	2	
Adj Approach Flow, veh/h	815	
Demand Flow Rate, veh/h	831	
Vehicles Circulating, veh/h	805	
Vehicles Exiting, veh/h	435	
Ped Vol Crossing Leg, #/h	2	
Ped Cap Adj	1.000	
Approach Delay, s/veh	16.6	
Approach LOS	C	
Lane	Left	Right
Designated Moves	LT	TR
Assumed Moves	LT	TR
RT Channelized		
Lane Util	0.471	0.529
Follow-Up Headway, s	2.667	2.535
Critical Headway, s	4.645	4.328
Entry Flow, veh/h	391	440
Cap Entry Lane, veh/h	644	716
Entry HV Adj Factor	0.979	0.982
Flow Entry, veh/h	383	432
Cap Entry, veh/h	630	703
V/C Ratio	0.608	0.614
Control Delay, s/veh	17.2	16.0
LOS	C	C
95th %tile Queue, veh	4	4

HCM 6th Roundabout
 Adams Street at Furnace Brook Parkway and Common Street

01/13/2021

Intersection								
Intersection Delay, s/veh	14.0							
Intersection LOS	B							
Approach	EB		WB		NB		NE	
Entry Lanes	2		2		1		2	
Conflicting Circle Lanes	2		2		2		2	
Adj Approach Flow, veh/h	903		446		354		545	
Demand Flow Rate, veh/h	921		455		364		551	
Vehicles Circulating, veh/h	523		920		1121		917	
Vehicles Exiting, veh/h	866		565		347		527	
Ped Vol Crossing Leg, #/h	6		15		15		15	
Ped Cap Adj	0.996		1.000		1.000		1.000	
Approach Delay, s/veh	13.4		11.3		22.5		14.6	
Approach LOS	B		B		C		B	
Lane	Left	Right	Left	Right	Left	Left	Right	
Designated Moves	LT	R	LT	TR	LR	L	TR	
Assumed Moves	LT	R	LT	TR	LR	L	TR	
RT Channelized								
Lane Util	0.610	0.390	0.470	0.530	1.000	0.296	0.704	
Follow-Up Headway, s	2.667	2.535	2.667	2.535	2.535	2.667	2.535	
Critical Headway, s	4.645	4.328	4.645	4.328	4.328	4.645	4.328	
Entry Flow, veh/h	562	359	214	241	364	163	388	
Cap Entry Lane, veh/h	834	910	579	650	548	581	651	
Entry HV Adj Factor	0.981	0.981	0.980	0.981	0.973	0.988	0.990	
Flow Entry, veh/h	551	352	210	236	354	161	384	
Cap Entry, veh/h	815	889	567	637	533	574	645	
V/C Ratio	0.676	0.396	0.370	0.371	0.665	0.281	0.596	
Control Delay, s/veh	16.5	8.7	11.9	10.8	22.5	10.1	16.5	
LOS	C	A	B	B	C	B	C	
95th %tile Queue, veh	5	2	2	2	5	1	4	

HCM 6th Roundabout
 Adams Street at Furnace Brook Parkway and Common Street

01/13/2021

Intersection		
Intersection Delay, s/veh		
Intersection LOS		
Approach	SW	
Entry Lanes	2	
Conflicting Circle Lanes	2	
Adj Approach Flow, veh/h	586	
Demand Flow Rate, veh/h	592	
Vehicles Circulating, veh/h	797	
Vehicles Exiting, veh/h	578	
Ped Vol Crossing Leg, #/h	9	
Ped Cap Adj	0.998	
Approach Delay, s/veh	11.5	
Approach LOS	B	
Lane	Left	Right
Designated Moves	LT	TR
Assumed Moves	LT	TR
RT Channelized		
Lane Util	0.470	0.530
Follow-Up Headway, s	2.667	2.535
Critical Headway, s	4.645	4.328
Entry Flow, veh/h	278	314
Cap Entry Lane, veh/h	648	721
Entry HV Adj Factor	0.990	0.988
Flow Entry, veh/h	275	310
Cap Entry, veh/h	641	711
V/C Ratio	0.430	0.436
Control Delay, s/veh	11.9	11.1
LOS	B	B
95th %tile Queue, veh	2	2

APPENDIX K
Comments from City of Quincy



CITY OF QUINCY, MASSACHUSETTS

Department of Traffic, Parking, Alarm and Lighting

Thomas P. Koch
Mayor

Allison L. Ruel, P.E.
Traffic Engineer

Phone: (617) 376-1962

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March 1, 2021

To: Chen-Yuan Wang & Mark Abbott
MPO Staff

From: Allison Ruel, Traffic Engineer

CC: Chris Cassani, TPAL Director

RE: Safety and Operations Analyses at Selected Intersections, FFY 2020
Adams Street at Furnace Brook Parkway and Common Street in Quincy

I have reviewed the memorandum summarizing the safety and operations analyses and proposed improvements for the intersections of Adams Street at Furnace Brook Parkway and Common Street in Quincy.

The report details the crash history of the intersection, discussing that the intersection of Adams Street and Furnace Brook Parkway is an HSIP eligible high crash location with 47 crashes over a 5-year period and the adjacent intersection of Adams Street and Common Street experienced 27 crashes over a 5-year period for a total of 72 crashes in the intersection cluster over the period reviewed. A significant number of crashes at both locations are angle collisions resulting from uncontrolled or permissive movements through the intersection.

There are also deficiencies at the intersection that aid in the crash experience and traffic congestion at this location including the geometry of the intersection, the lack of exclusive turn lanes, inadequate signal displays, pedestrian accessibility and safety, and lack of bicycle facilities. The report also identifies the desire line from the unsignalized Common Street approach to connect to Adams Street and Furnace Brook Parkway and the difficulties that presents.

Based on the analysis conducted several short-term and long-term recommendations were proposed. The short-term improvements include enforcing existing speed and turn restriction regulations, enlarging the 'Do Not Block the Box' striping, optimizing traffic signal timings, restriping travel lanes to reduce lanes widths and better accommodate bicycles, add backplates to existing signal heads to improve visibility, add an additional stop sign on Common Street, and more clearly define the parking spaces on Adams Street. We agree that these short-term improvements would have a benefit on improving safety and reducing traffic congestion at these intersections.

Four long-term alternatives were identified in the report at the two intersections to maximize safety and operations for the intersections:

Alternative 1 proposed to reconstruct the two intersections and upgrade the traffic signal at the Adams Street/Furnace Brook Parkway intersection, while leaving the Common Street intersection unsignalized. While this alternative would help mitigate many of the issues at the Adams Street/Furnace Brook Parkway intersection, it would not have a significant impact on the safety issues that exist at the Adams Street and Common Street

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intersection and therefore is not preferred by the City.

Alternative 2 proposes to reconstruct both intersections, upgrade signals at the intersection of Adams Street/Furnace Brook Parkway and signalize the Common Street intersection as part of a single clustered intersection. This alternative would have similar geometric and lane improvements as Alternative 1, but the signalized control of Common Street would help mitigate many of the safety issues without restricting movements exiting Common Street and is therefore the City's preferred alternative of the signalized Alternatives presented.

Alternative 3 proposes to reconstruct both intersections, upgrade signals at Adams Street and Furnace Brook Parkway, and extend the median on Adams Street to restrict Common Street to a right-in/right-out condition. Common Street provides a critical connection to Copeland Street and Centre Street to South and West Quincy and restricting connectivity to/from this roadway at Adams Street is not preferred by the City.

Alternative 4 reconstructs both intersections into a double-lane modern roundabout, tying in Common Street via a separate approach. The alternative also moves bicycles to off-street facilities. We agree the isolated nature of this intersection cluster and the traffic calming and improvement on traffic congestion that a roundabout alternative brings makes this the preferred alternative. We ask that non-traditional roundabout alternatives to be further evaluated in the design process, including potentially an ellipse, a double roundabout, or a "Figure 8" or "Peanut" shaped roundabout. The Common Street and Adams Street approaches to the east are very close together in the existing concept which may be confusing to motorists. We also have concerns over the school zone crossing with the current roundabout concept. Under existing conditions, the intersection is managed by a crossing guard who stops travel in all directions for children to cross the road.

In summary, we feel that the reconstruction of this intersection to an unsignalized roundabout alternative is the preferred alternative, though there should be more exploration of non-traditional roundabout designs through the design process. If a signalized alternative is entertained, it is important that the Common Street approach be tied into the signal system to provide safer access while still maintaining full connectivity to and from the roadway.

APPENDIX L
MassDOT Project Development Process

Overview of the Project Development Process

Transportation decision-making is complex and can be influenced by legislative mandates, environmental regulations, financial limitations, agency programmatic commitments, and partnering opportunities. Decision-makers and reviewing agencies, when consulted early and often throughout the project development process, can ensure that all participants understand the potential impact these factors can have on project implementation. Project development is the process that takes a transportation improvement from concept through construction.

The MassDOT Highway Division has developed a comprehensive project development process which is contained in Chapter 2 of the *MassDOT Highway Division's Project Development and Design Guide*. The eight-step process covers a range of activities extending from identification of a project need, through completion of a set of finished contract plans, to construction of the project. The sequence of decisions made through the project development process progressively narrows the project focus and, ultimately, leads to a project that addresses the identified needs. The descriptions provided below are focused on the process for a highway project, but the same basic process will need to be followed for non-highway projects as well.

1. Needs Identification

For each of the locations at which an improvement is to be implemented, MassDOT leads an effort to define the problem, establishes project goals and objectives, and defines the scope of the planning needed for implementation. To that end, it has to complete a Project Need Form (PNF), which states in general terms the deficiencies or needs related to the transportation facility or location. The PNF documents the problems and explains why corrective action is needed. For this study, the information defining the need for the project will be drawn primarily, perhaps exclusively, from the present report. Also, at this point in the process, MassDOT meets with potential participants, such as the Metropolitan Planning Organization (MPO) and community members, to allow for an informal review of the project.

The PNF is reviewed by the MassDOT Highway Division district office whose jurisdiction includes the location of the proposed project. MassDOT also sends the PNF to the MPO, for informational purposes. The outcome of this step determines whether the project requires further planning, whether it is already well supported by prior planning studies, and, therefore, whether it is ready to move forward into the design phase, or whether it should be dismissed from further consideration.

2. Planning

This phase will likely not be required for the implementation of the improvements proposed in this planning study, as this planning report should constitute the outcome of this step. However, in general, the purpose of this implementation step is for the project proponent to identify issues, impacts, and approvals that may need to be obtained, so that the subsequent design and permitting processes are understood.

The level of planning needed will vary widely, based on the complexity of the project. Typical tasks include: define the existing context, confirm project need, establish goals and objectives, initiate public outreach, define the project, collect data, develop and analyze alternatives, make recommendations, and provide documentation. Likely outcomes include consensus on the project definition to enable it to move forward into environmental documentation (if needed) and design, or a recommendation to delay the project or dismiss it from further consideration.

3. Project Initiation

At this point in the process, the proponent, MassDOT Highway Division, fills out a Project Initiation Form (PIF) for each improvement, which is reviewed by its Project Review Committee (PRC) and the MPO. The PRC is composed of the Chief Engineer, each District Highway Director, and representatives of the Project Management, Environmental, Planning, Right-of-Way, Traffic, and Bridge departments, and the MassDOT Federal Aid Program Office (FAPO). The PIF documents the project type and description, summarizes the project planning process, identifies likely funding and project management responsibility, and defines a plan for interagency and public participation. First the PRC reviews and evaluates the proposed project based on the MassDOT's statewide priorities and criteria. If the result is positive, MassDOT Highway Division moves the project forward to the design phase, and to programming review by the MPO. The PRC may provide a Project Management Plan to define roles and responsibilities for subsequent steps. The MPO review includes project evaluation based on the MPO's regional priorities and criteria. The MPO may assign project evaluation criteria score, a Transportation Improvement Program (TIP) year, a tentative project category, and a tentative funding category.

4. Environmental Permitting, Design, and Right-of-Way Process

This step has four distinct but closely integrated elements: public outreach, environmental documentation and permitting (if required), design, and right-of-way acquisition (if required). The outcome of this step is a fully designed and permitted project ready for construction. However, a project does not have to be fully designed in order for the MPO to program it in the TIP. The sections below provide more detailed information on the four elements of this step of the project development process.

Public Outreach

Continued public outreach in the design and environmental process is essential to maintain public support for the project and to seek meaningful input on the design elements. The public outreach is often in the form of required public hearings, but can also include less formal dialogues with those interested in and affected by a proposed project.

Environmental Documentation and Permitting

The project proponent, in coordination with the Environmental Services section of the MassDOT Highway Division, will be responsible for identifying and complying with all applicable federal, state, and local environmental laws and requirements. This includes determining the appropriate project category for both the Massachusetts Environmental Protection Act (MEPA) and the National Environmental Protection Act (NEPA). Environmental documentation and permitting is often completed in conjunction with the **Preliminary Design** phase described below.

Design

There are three major phases of design. The first is **Preliminary Design**, which is also referred to as the 25-percent submission. The major components of this phase include full survey of the project area, preparation of base plans, development of basic geometric layout, development of preliminary cost estimates, and submission of a functional design report. Preliminary Design, although not required to, is often completed in conjunction with the Environmental Documentation and Permitting. The next phase is **Final Design**, which is also referred to as the 75-percent and 100-percent submission. The major components of this phase include preparation of a subsurface exploratory plan (if required), coordination of utility relocations, development of traffic management plans through construction zones, development of final cost estimates, and refinement and finalization of the construction plans. Once Final Design is complete, a full set of **Plans, Specifications, and Estimates (PS&E)** is developed for the project.

Right-of-Way Acquisition

A separate set of Right-of-Way plans are required for any project that requires land acquisition or easements. The plans must identify the existing and proposed layout lines, easements, property lines, names of property owners, and the dimensions and areas of estimated takings and easements.

5. Programming (Identification of Funding)

Programming, which typically begins during the design phase, can actually occur at any time during the process, from planning to design. In this step, which is distinct from project initiation, the proponent requests that the MPO place the project in the region's Transportation Improvement Program (TIP). The proponent requesting the project's listing on the TIP can be the community or it can be one of the MPO member agencies (the Regional Planning Agency, MassDOT, and the Regional Transit Authority). The MPO then considers the project in terms of state and regional needs, evaluation criteria, and compliance with the regional Transportation Plan and decides whether to place it in the draft TIP for public review and then in the final TIP.

6. Procurement

Following project design and programming of a highway project, the MassDOT Highway Division publishes a request for proposals. It then reviews the bids and awards the contract to the qualified bidder with the lowest bid.

7. Construction

After a construction contract is awarded, MassDOT Highway Division and the contractor develop a public participation plan and a management plan for the construction process.

8. Project Assessment

The purpose of this step is to receive constituents' comments on the project development process and the project's design elements. MassDOT Highway Division can apply what is learned in this process to future projects.

Project Development Schematic Timetable

Description	Schedule Influence	Typical Duration
<p>Step I: Problem/Need/Opportunity Identification The proponent completes a Project Need Form (PNF). This form is then reviewed by the MassDOT District office which provides guidance to the proponent on the subsequent steps of the process.</p>	<p>The Project Need Form has been developed so that it can be prepared quickly by the proponent, including any supporting data that is readily available. The District office shall return comments to the proponent within one month of PNF submission.</p>	<p>1 to 3 months</p>
<p>Step II: Planning Project planning can range from agreement that the problem should be addressed through a clear solution to a detailed analysis of alternatives and their impacts.</p>	<p>For some projects, no planning beyond preparation of the Project Need Form is required. Some projects require a planning study centered on specific project issues associated with the proposed solution or a narrow family of alternatives. More complex projects will likely require a detailed alternatives analysis.</p>	<p>Project Planning Report: 3 to 24+ months</p>
<p>Step III: Project Initiation The proponent prepares and submits a Project Initiation Form (PIF) and a Transportation Evaluation Criteria (TEC) form in this step. The PIF and TEC are informally reviewed by the Metropolitan Planning Organization (MPO) and MassDOT District office, and formally reviewed by the PRC.</p>	<p>The PIF includes refinement of the preliminary information contained in the PNF. Additional information summarizing the results of the planning process, such as the Project Planning Report, are included with the PIF and TEC. The schedule is determined by PRC staff review (dependent on project complexity) and meeting schedule.</p>	<p>1 to 4 months</p>
<p>Step IV: Design, Environmental, and Right of Way The proponent completes the project design. Concurrently, the proponent completes necessary environmental permitting analyses and files applications for permits. Any right of way needed for the project is identified and the acquisition process begins.</p>	<p>The schedule for this step is dependent upon the size of the project and the complexity of the design, permitting, and right-of-way issues. Design review by the MassDOT district and appropriate sections is completed in this step.</p>	<p>3 to 48+ months</p>
<p>Step V: Programming The MPO considers the project in terms of its regional priorities and determines whether or not to include the project in the draft Regional Transportation Improvement Program (TIP) which is then made available for public comment. The TIP includes a project description and funding source.</p>	<p>The schedule for this step is subject to each MPO's programming cycle and meeting schedule. It is also possible that the MPO will not include a project in its Draft TIP based on its review and approval procedures.</p>	<p>3 to 12+ months</p>
<p>Step VI: Procurement The project is advertised for construction and a contract awarded.</p>	<p>Administration of competing projects can influence the advertising schedule.</p>	<p>1 to 12 months</p>
<p>Step VII: Construction The construction process is initiated including public notification and any anticipated public involvement. Construction continues to project completion.</p>	<p>The duration for this step is entirely dependent upon project complexity and phasing.</p>	<p>3 to 60+ months</p>
<p>Step VIII: Project Assessment The construction period is complete and project elements and processes are evaluated on a voluntary basis.</p>	<p>The duration for this step is dependent upon the proponent's approach to this step and any follow-up required.</p>	<p>1 month</p>

Source: MassDOT Highway Division Project Development and Design Guide