MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

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Governor
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MEMORANDUM

TO: TEAM LEADER MARIE-FRANCE GUITEAU
HIGHWAY DESIGN DIVISION

FROM: DIVISION CHIEF RANA SHAMS
TRAVEL FORECASTING AND ANALYSIS DIVISION

SUBJECT: BIKE FACILITY ON MD 390 (16th STREET) NORTHBOUND
SHA FMIS NO. MO998B21

MONTGOMERY COUNTY

PREPARED BY: CONSULTANT TEAM LEADER SCOTT HOLCOMB, 410-545-5647 and
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DATE: MARCH 12, 2025

RESPONSE REQUESTED BY: OFFICE OF HIGHWAY DEVELOPMENT

I. PURPOSE OF MEMORANDUM

The Office of Highway Development (OHD) is designing improvements to the MD 390/16th Street corridor between Spring Street and MD 97 to provide a two-way protected cycle track in the existing NB roadway section. One existing NB traffic lane will be repurposed for this change, resulting primarily in two lanes in that direction. The existing SB lanes will remain open to vehicular traffic.

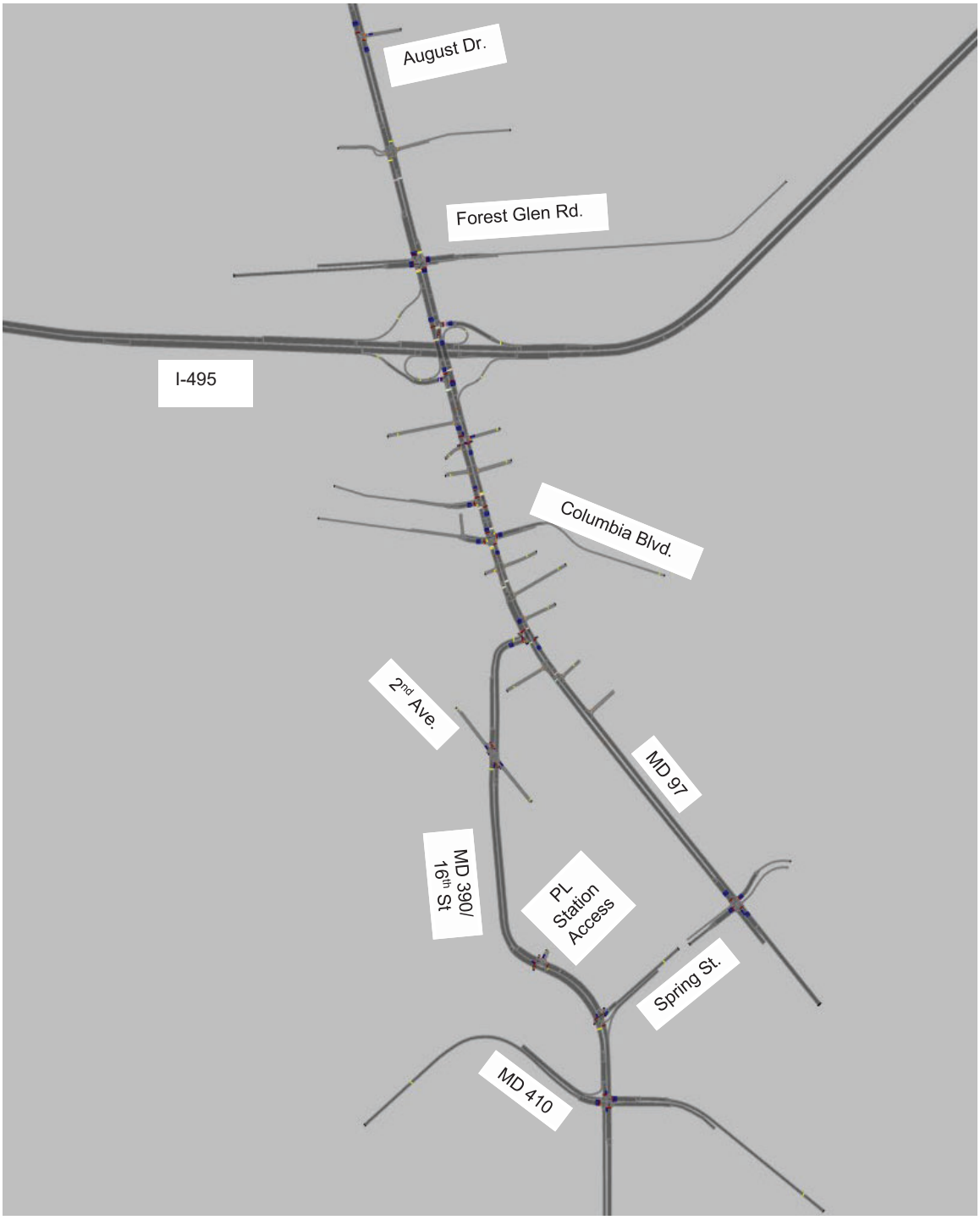
OHD requested that the Travel Forecasting and Analysis Division (TFAD) perform operational analyses to assist with supporting decisions on design elements of the project, including roadway geometry at and between intersections, use of signal phases for bicyclists, turn prohibitions, etc. The analysis documented in this memorandum was performed with the assumption that the proposed improvements for the MD 97 Montgomery Hills project from MD 390 to north of I-495 will be in place in the No-Build and Build conditions.

II. TRAFFIC OPERATIONS ANALYSIS

ANALYSIS NETWORK

To analyze the operations proposed with the lane reduction along MD 390 northbound from Spring Street to MD 97, VISSIM simulation models originally developed for a different project (the Montgomery Hills MD 97 Preferred Roadway Improvement Alternative (5B Modified)) were utilized. The original model coverage was expanded to include the MD 390 corridor section from MD 410 to MD 97 along with the MD 97 corridor from Spring Street to August Drive, as shown in Exhibit 1.

Exhibit 1 - VISSIM Network



Although the MD 390 northbound travel lane is repurposed from Spring Street to MD 97 with the bicycle lane, the MD 390 eastbound approach at MD 97 (Georgia Avenue) at the north end still is proposed to have three lanes consistent with the MD 97 Montgomery Hills project. Also, the number of travel lanes of the MD 390 segment from Spring Street to the future Purple Line

Station access is reduced to two lanes from the existing four lanes (three lanes plus aux. lane). The MD 97 Montgomery Hills improvements from 5B Modified are included in the model for this effort including roadway/intersection geometry and traffic signal phasing updated with the latest SHA Traffic Signalization Plan (Ultimate) for each of the signalized intersections.

ANALYSIS SCENARIOS/OPTIONS

Based on the latest SHA PI (Preliminary Investigation) plan concept for MD 390 (16th Street) Pedestrian Bicycle Route and discussions with the design team following that meeting, the following scenarios were considered, involving operations at each of the three primary intersections along the MD 390 study section.

Spring Street Intersection Scenarios

1. No Build
2. Build with NB right turn lane (current design) developed with the current rightmost through lane and a signal phase for the NB/SB bicycles on the bike lanes that will delay all MD 390 SB lefts and NB rights. The NB approach will have two thru lanes and one right turn lane, and the WB approach on Spring Street will have two lanes without the current WB right turn lane.

Purple Line Station Intersection Scenarios

1. No Build
2. Build with no NB right turn lane (current design) and a signal phase for NB/SB bicycles on the bicycle lanes that will stop all MD 390 SB lefts and NB traffic (thru and right).
3. Build with NB right turn lane (approximately 100 ft) and a signal phase for the NB/SB bicycles on the bike lanes that will delay all MD 390 SB lefts and NB rights.
4. Both #2 and #3 with the SB left into the Station not allowed per the MTA Purple Line project plans.

2nd Avenue intersection Scenarios

1. No Build
2. Build w/ no NB right turn lane (current design) and NB right turns prohibited in peaks with a signal phase for NB/SB bicycles on bike lanes (delays SB lefts in peaks/off-peak and all NB traffic in non-peaks).
3. Build w/ no NB right turn lane (current design) and NB right turns allowed in peaks with a signal phase for NB/SB bicycles on bike lanes (delays SB lefts and all NB traffic in peaks/off-peak).

From the listed scenarios of each intersection, the five Build Option combinations presented in **Exhibit 2** were modeled in this study. Each of the Build Options has a bicycle crossing across the side streets of the intersections in both NB and SB directions along the east side of MD 390 with the reduced northbound MD 390 travel lanes. From the PI plan concept and subsequent discussions with OHD, a pedestrian crosswalk across MD 390 was added to the Purple Line Station intersection for the Build options in addition to the current pedestrian crossings at Spring Street and 2nd Avenue.

Exhibit 2 Build Options with MD 390 Bicycle Lane Operations

Build Options	MD 390 at Spring St.	MD 390 at Purple Line Station Access	MD 390 at 2nd Ave.
Option 1:	#2	#2	#2
Option 1A:	#2	#2, #4	#2
Option 2:	#2	#3	#2
Option 2A:	#2	#3, #4	#2
Option 3:	#2	#3	#3

ANALYSIS TRAFFIC VOLUMES

Future 2040 traffic volumes for MD 390 were prepared based on 2017 Montgomery County traffic count data, which were the latest available data before the Covid-19 pandemic, that were then forecasted using MWCOG travel demand model growth (Version 2.4 with Round 9.2 Land Use) in this area. The growth rate of 0.4% per year was applied to the base year volumes, and the resulting corridor volumes were matched with the MD 97 Montgomery Hills project corridor volumes used in the previous MD 97 roadway improvement analyses. The project team agreed that future volumes for the MD 97 and MD 390 projects were not updated to 2045 for this and recent analyses due to limitations in project schedules.

Considering the future Purple Line Station site plan concept and conversations on its use with the project team and Purple Line project staff, 100 vehicles per hour (vph) were assumed for the vehicular traffic from/to the station during each of AM and PM peak periods, where 50% each would be distributed to north and south on MD 390. Since Options 1A and 2A do not allow the SB left turn into the Purple Line Station, the expected left turn traffic into the station was rerouted to MD 97 and Spring Street. For Option 3, without the NB right turn restriction at 2nd Avenue, 15 and 40 vph were assumed to reroute to the 2nd Avenue intersection from the Spring Street intersection during the AM and PM peak period, respectively.

To simulate the bicycle crossings, stochastic crossings of 10-20 bicycles per hour in each direction at the three MD 390 intersections were assumed. Also, with the addition of the SB left turn at MD 97/Columbia Boulevard/Seminary Road in the changes to the Montgomery Hills project, some of the MD 97 SB left turn volumes at Flora Lane were reassigned to the SB left turn at Columbia Boulevard. The forecasted MD 390 volumes by analysis option and the adjusted MD 97 volumes are provided in **Attachments 1A** and **1B**.

MODEL RESULTS

Being associated with the intersection geometry and bicycle crossings by each of the Build Options, the traffic signal data were inputted in the AM and PM simulation models. Traffic signal parameters including phase lengths and offsets were separately optimized in Synchro software and adjusted in the VISSIM model with several trial runs to obtain reasonable traffic flows. VISSIM software Version 2022 SP13 was used for this study.

Network performance results from the VISSIM model runs are provided in **Exhibit 3** and **Attachment 2A.** The results indicate that with the MD 390 NB lane reduction with intersection bicycle crossings, the networkwide total delays will increase by 2-4% during the AM peak period from the MD 390 No Build condition and by 8-13% during the PM peak period. AM total network delays did not vary significantly with the Build Options as the lane reduction was not in the peak direction of travel. Option 2A had the highest total network delay during the AM peak period, with the others varying by no more than 1% from each other.

For the PM, Option 2 had the lowest total delay, and Option 3 had the highest total delay followed by Option 2A and Option 1A, which have higher MD 390 northbound volumes than for No Build, Option 1, and Option 2. Option 3 is the only option where NB right turns at 2nd Avenue are allowed in the peak hours, which requires a bike lane delay for all NB traffic as there is no right turn lane to separate out the right turners. Options 2A and 1A close the SB left into the Purple Line Station which requires added traffic to divert to NB MD 390 to make a right into the station.

Latent demand and delay are the number of vehicles (and their delay) from the vehicle input origins that could not be used until the end of the simulation due to queues blocking entering vehicles under oversaturated condition. In this project, the resulting latent delay is a small percentage of overall network delay and is shown to be less significant than changes in in-network delay.

Exhibit 3: VISSIM Network Performance Results (2040)

Options Analyzed	In-Network Delay (Hours)	Out of Network (Latent) Delay (Hours)	Total Delay (Hours)	Change in Total Delay Compared to No Build	Latent Demand* (Vehicles)
AM Peak Hour					
2040 No Build	969	10	979	--	84
2040 Build Option 1	994	6	1000	2%	60
2040 Build Option 1A	990	8	998	2%	65
2040 Build Option 2	989	10	999	2%	89
2040 Build Option 2A	1010	7	1017	4%	71
2040 Build Option 3	1002	8	1010	3%	83
PM Peak Hour					
2040 No Build	710	10	720	--	15
2040 Build Option 1	753	22	775	8%	45
2040 Build Option 1A	761	24	785	9%	59
2040 Build Option 2	763	4	767	7%	4
2040 Build Option 2A	758	30	788	10%	105
2040 Build Option 3	798	13	811	13%	28

The resulting intersection delay and Level of Service (LOS) results are provided in **Exhibit 4** and **Attachment 2B**. Review of the overall intersection delays shows that during the AM peak period, the impact of the build options along MD 390 (16th Street) NB approaching MD 97 from Spring Street is expected to be minimal. The LOS of the Purple Line station intersection is expected to change from *A* to *B* with the bicycle lane in place during the AM peak period. The other intersections maintain their current LOS except for MD 410, which varies slightly above and below the delay threshold needed for LOS *E* and *F*. Options 1A and 2A, which eliminate the left turn into the Purple Line Station and reroute traffic to NB MD 390 result in the LOS remaining at an *F* at MD 410.

During the PM peak period, overall delays at the two southern MD 390 intersections at Spring Street and MD 410 (East-West Highway) increased with all of the build options having the bicycle lane and only two vehicle lanes in place.

At the MD 390/Spring Street intersection, Options 1, 2, and 3 increased average vehicle delays by 25-30 seconds per vehicle, changing the LOS from *B* to *C* or *D*. These increases result from fewer available lanes (both northbound through lanes and westbound Spring Street lanes), along with the addition of the bicycle signal phase across Spring Street With Options 1A and 2A, the intersection operation further degrades to LOS *E* (delay increases approximately 46 seconds) since the MD 390 SB left turn traffic at the Purple Line Station is assumed to divert to Spring Street via MD 97 to turn right into the station.

For the MD 390 at MD 410 intersection, the overall PM intersection LOS changes from *D* to *E* under most of the build options since queuing at the NB downstream intersections, Spring Street and Purple Line Station, impact the MD 410 intersection. The exception is Option 2 which provides a NB right turn lane into the Purple Line Station. Option 3 has the same layout at the Purple Line Station as Option 2 but has a higher NB volume due to right turns being allowed at 2nd Avenue, which is why the delay is higher for Option 3.

Exhibit 4: Intersection LOS Results by Build Option (2040)

MD 390 at	No Build		Option 1		Option 1A		Option 2		Option 2A		Option 3	
	Avg. Delay	LOS	Avg. Delay	LOS	Avg. Delay	LOS	Avg. Delay	LOS	Avg. Delay	LOS	Avg. Delay	LOS
AM Peak Period												
MD 97	15.6	B	17.0	B	17.1	B	16.8	B	17.6	B	17.0	B
2nd Ave.	30.7	C	23.2	C	22.7	C	23.6	C	23.4	C	23.3	C
Purple Line Sta.	5.2	A	12.9	B	13.0	B	11.3	B	11.1	B	11.4	B
Spring St.	21.4	C	32.2	C	32.0	C	27.8	C	34.4	C	27.1	C
MD 410	80.8	F	79.9	E	80.4	F	72.0	E	83.1	F	73.1	E
PM Peak Period												
MD 97	57.7	E	54.3	D	54.3	D	65.7	E	54.3	D	61.2	E
2nd Ave.	26.8	C	32.7	C	28.3	C	36.7	D	27.3	C	40.5	D
Purple Line Sta.	8.6	A	17.0	B	10.6	B	8.2	A	6.8	A	12.4	B
Spring St.	12.0	B	41.3	D	58.0	E	28.1	C	58.5	E	32.5	C
MD 410	39.6	D	75.5	E	68.0	E	53.6	D	65.6	E	73.9	E

(Delay Unit: Seconds/vehicle)

During the AM peak period, the NB traffic throughput simulated at the MD 390 intersections are 98-100% of the input AM volumes. The SB traffic throughput simulated is 91-94% of the AM input due to the SB delays/queues at the upstream intersections along the MD 97 corridor metering traffic from entering MD 390 and not changes to MD 390 itself. The future oversaturated conditions at the MD 410 intersection cause some delays and queues between Spring Street and MD 410, regardless of the build scenario. As a result, all build options reveal notable queues and delays on the WB Spring Street (which is also impacted by the removal of the WB right-turn lane).

With the build options, the maximum queues on WB Spring Street at MD 390 increase by approximately 320-440 feet from the No Build condition in the AM peak, and the maximum right-turn queues on NB MD 390 at Spring Street increase by 160-230 feet. At the Purple Line Station intersection, the maximum queues on NB MD 390 increase by 100-210 feet. Option 1A, which has more northbound traffic on MD 390 due to the closure of the SB left into the Purple Line Station and no right turn lane at the station, has the longest queue length in the AM peak. Queue results are summarized in **Exhibits 5 and 6** and **Attachments 2B** and **2C**.

During the PM peak period, the NB and SB traffic throughput simulated at the MD 390 intersections are 95-100% of the input PM volumes. The oversaturated MD 390 section between MD 410 and Spring Street results in queues exceeding their own storage lengths along both directions of the MD 390 section.

For the MD 390/Spring Street intersection, the build options do not have the existing dedicated WB right turn lane on Spring Street along with the reduced NB through lanes. As a result, the simulation model shows notable delays and queues on the WB Spring Street approach under the build options due to the reduction in available capacity approaching the intersection. With Options 1A and 2A, which have higher volumes on Spring Street due to closing the SB left into the Purple Line Station, the WB Spring Street approach has excessive delays (more than 300 seconds) and queues (more than 900 feet) in the PM peak. Also, under the build options, the NB queues at Spring Street are backing up to the MD 410 intersection, resulting in notable delays and queues on the MD 410 WB approach in the PM. The NB right-turn maximum queues on MD 390 at Spring Street increase by approximately 120-240 feet between the build options.

At the Purple Line Station access, in the PM peak period, the NB maximum queues on the MD 390 approach increase from approximately 280 feet with No Build to 750 feet with Option 1, while with Option 2 which provides a NB right turn lane, the NB maximum queues increase to 490 feet (the other options are generally between these values). At the 2nd Avenue intersection, in the PM peak period, the NB maximum queues increase from approximately 670 feet with No Build to over 1,000 feet with the build options. Option 3 which allows right turns on NB MD 390 at 2nd Avenue has the longest maximum through movement queue length at 1,515 feet on the NB approach.

At the MD 97 intersection, in the AM peak, the EB maximum queues on the MD 390 approach increase from about 380 feet with the No Build to over 525 feet with the build options, while in the PM peak, the EB maximum queues increase from almost 1,000 feet to over 1,200 feet.

Exhibit 5 Intersection Queue Analysis Results by Build Option (2040 AM)

	Mvmt.	No Build		Option 1		Option 1A		Option 2		Option 2A		Option 3	
		Avg. Queue (ft)	Max. Queue (ft)	Avg. Queue (ft)	Max. Queue (ft)	Avg. Queue (ft)	Max. Queue (ft)	Avg. Queue (ft)	Max. Queue (ft)	Avg. Queue (ft)	Max. Queue (ft)	Avg. Queue (ft)	Max. Queue (ft)
MD 390 at MD 97	SBR	80	917	82	863	82	943	76	844	90	963	80	868
	SBT	80	917	82	863	82	943	76	844	90	963	80	868
	EBR	72	377	97	557	107	583	99	573	109	581	99	526
	EBL	72	377	97	557	107	583	99	573	109	581	99	526
	NBT	36	432	37	467	37	407	39	433	37	435	38	475
MD 390 at 2nd Ave	EBL	130	448	125	439	126	439	127	443	125	439	126	439
	EBT	130	448	125	439	126	439	127	443	125	439	126	439
	EBR	130	448	125	439	126	439	127	443	125	439	126	439
	WBR	29	193	30	195	29	195	30	195	30	195	30	195
	WBT	29	193	30	195	29	195	30	195	30	195	30	195
	WBL	29	193	30	195	29	195	30	195	30	195	30	195
	SBR	136	627	79	500	72	521	74	501	71	509	77	585
	SBL	136	627	79	500	72	521	74	501	71	509	77	585
	SBT	136	627	79	500	72	521	74	501	71	509	77	585
	NBL	77	290	77	331	76	394	84	485	75	378	79	400
	NBT	11	124	6	173	7	241	9	252	14	304	9	251
	NBR	11	124	6	173	7	241	9	252	14	304	9	251
MD 390 at Purple Line Sta. Access	NBT	11	166	41	344	47	379	21	300	26	333	23	273
	NBR	11	166	41	344	47	379	21	300	26	333	23	273
	SBT	13	462	60	615	52	589	62	610	52	568	62	653
	SBL	13	462	60	615	#N/A	#N/A	62	610	#N/A	#N/A	62	653
	WBR	32	109	32	109	32	109	32	109	32	109	32	109
	WBL	32	109	32	109	32	109	32	109	32	109	32	109
MD 390 at Spring St.	NBT	33	442	125	568	103	607	102	521	125	582	95	522
	NBR	7	316	74	529	51	536	53	508	74	545	47	475
	WBR	0	37	125	473	136	429	95	384	139	438	88	353
	WBL	127	453	125	473	136	429	95	384	139	438	88	353
	SBT	61	516	99	549	113	594	97	562	115	625	102	600
	SBL	61	516	99	549	113	594	97	562	115	625	102	600
MD 390 at MD 410	NBT	153	470	293	729	266	764	146	499	150	452	182	653
	NBR	97	448	238	716	191	761	94	465	97	418	119	645
	NBL	153	470	293	729	266	764	146	499	150	452	182	653
	WBR	68	327	61	303	67	324	65	318	68	305	64	286
	WBL	1171	2165	875	1982	880	1744	867	1714	1246	2275	914	1999
	WBT	1171	2165	875	1982	880	1744	867	1714	1246	2275	914	1999
	SBT	288	760	270	750	276	764	244	752	265	769	237	737
	SBL	288	760	270	750	276	764	244	752	265	769	237	737
	SBR	57	559	38	471	52	430	43	481	40	415	41	500
	EBL	185	656	234	818	244	848	274	800	217	731	227	710
	EBR	185	656	234	818	244	848	274	800	217	731	227	710
	EBT	185	656	234	818	244	848	274	800	217	731	227	710

Exhibit 6 Intersection Queue Analysis Results by Build Option (2040 PM)

	Mvmt.	No Build		Option 1		Option 1A		Option 2		Option 2A		Option 3	
		Avg. Queue (ft)	Max. Queue (ft)	Avg. Queue (ft)	Max. Queue (ft)	Avg. Queue (ft)	Max. Queue (ft)	Avg. Queue (ft)	Max. Queue (ft)	Avg. Queue (ft)	Max. Queue (ft)	Avg. Queue (ft)	Max. Queue (ft)
MD 390 at MD 97	SBR	307	924	273	894	294	914	370	952	302	939	328	941
	SBT	307	924	273	894	294	914	370	952	302	939	328	941
	EBR	349	994	517	1258	524	1320	630	1311	447	1216	616	1276
	EBL	349	994	517	1258	524	1320	630	1311	447	1216	616	1276
	NBT	263	799	262	760	249	842	327	1037	279	891	290	881
MD 390 at 2nd Ave	EBL	98	397	125	441	136	503	148	499	133	479	160	499
	EBT	98	397	125	441	136	503	148	499	133	479	160	499
	EBR	98	397	125	441	136	503	148	499	133	479	160	499
	WBR	18	125	18	144	19	140	19	140	19	145	24	148
	WBT	18	125	18	144	19	140	19	140	19	145	24	148
	WBL	18	125	18	144	19	140	19	140	19	145	24	148
	SBR	74	460	72	422	69	415	80	471	68	426	77	443
	SBL	74	460	72	422	69	415	80	471	68	426	77	443
	SBT	74	460	72	422	69	415	80	471	68	426	77	443
	NBL	152	672	245	1551	143	1145	262	1336	152	1068	308	1598
	NBT	51	544	123	1269	62	944	207	1254	63	809	269	1515
	NBR	51	544	123	1269	62	944	207	1254	63	809	269	1515
MD 390 at Purple Line Sta. Access	NBT	38	283	165	749	107	562	65	491	52	449	102	580
	NBR	38	283	165	749	107	562	65	491	52	449	102	580
	SBT	32	422	37	423	2	174	8	276	2	159	33	330
	SBL	32	422	37	423	#N/A	#N/A	8	276	#N/A	#N/A	33	330
	WBR	25	109	26	109	26	109	24	109	26	109	25	109
	WBL	25	109	26	109	26	109	24	109	26	109	25	109
MD 390 at Spring St.	NBT	40	661	284	774	218	776	170	726	212	724	230	775
	NBR	17	526	169	763	117	689	73	645	123	661	123	738
	WBR	0	56	266	680	665	980	207	513	667	942	209	577
	WBL	40	261	266	680	665	980	207	513	667	942	209	577
	SBT	24	313	60	478	53	389	45	370	64	445	48	340
	SBL	24	313	60	478	53	389	45	370	64	445	48	340
MD 390 at MD 410	NBT	163	576	277	943	226	651	173	574	233	784	289	871
	NBR	163	576	277	943	226	651	173	574	233	784	289	871
	NBL	163	576	277	943	226	651	173	574	233	784	289	871
	WBR	177	655	715	1227	625	1119	432	1036	520	1200	621	1142
	WBL	177	655	715	1227	625	1119	432	1036	520	1200	621	1142
	WBT	177	655	715	1227	625	1119	432	1036	520	1200	621	1142
	SBT	169	596	264	773	218	663	206	742	217	636	232	657
	SBL	169	596	264	773	218	663	206	742	217	636	232	657
	SBR	22	360	54	537	48	503	45	451	44	441	42	489
	EBL	143	799	219	1008	219	984	149	787	280	1282	310	1072
	EBR	58	249	60	249	60	255	59	252	62	253	61	254
	EBT	143	799	219	1008	219	984	149	787	280	1282	310	1072

III. SUMMARY AND CONCLUSIONS

This study was performed to evaluate the operations with the lane repurposing along MD 390 (16th Street) NB based on the latest SHA PI (Preliminary Investigation) plan concept and discussions with the design team. Five build scenarios were considered, involving combinations of geometric and signal timing scenarios at 2nd Avenue, the future Purple Line Station entrance, and Spring Street along the MD 390 study section.

The future 2040 traffic volumes were estimated based on the latest count data before the Covid-19 pandemic and forecasted MWCOG model growth in this area. A growth rate of 0.4% per year was applied to the existing volumes, and the resulting corridor volumes were matched with the MD 97 corridor volumes used in the MD 97 Montgomery Hills Project. Considering the future station site plan concept and conversations with project stakeholders, the future station access volumes were assumed.

Network performance results from the VISSIM model runs indicate that with the MD 390 NB lane reduction with bicycle crossings along the MD 390 corridor, the networkwide total delays will increase by 2-4% during the AM peak period from the No Build condition and by 8-13% during the PM peak period. It appears that Option 2, which has a northbound right turn lane into the Purple Line Station, has better general performance than for any other build options. During the AM peak period, the impact of the build options along MD 390 (16th Street) NB approaching MD 97 from Spring Street is expected to be minimal.

During the PM peak period, overall delays at the two southern MD 390 intersections at Spring Street and MD 410 (East-West Highway) are simulated to increase with the bicycle lane operation in place. It appears that Option 1A and Option 2A that prohibit the southbound left turn onto the Purple Line Station access degrade the intersection LOS at Spring Street due to station traffic diverting to that intersection. The oversaturated MD 390 section between MD 410 and Spring Street results in queues exceeding their own storage lengths along both directions of the MD 390 section. The PM simulation model shows extensive delays and queues on the WB Spring Street approach under the build options due to the reduction in available capacity approaching the intersection as well as congestion on MD 390.

Based on the VISSIM model analyses, conclusions revealed are follows:

- The bicycle lane and signal phasing operation along MD 390 NB with the travel lane reduction from Spring Street to MD 97 is expected to have minor impacts on the LOS and delay at the MD 390 intersections during the AM peak period and moderate impact during the PM peak period, although notable increases in delays and queues are forecast to be experienced by particular movements at the two southern intersections, particularly during the PM peak period.
- The travel lane reductions at the MD 390/Spring Street intersection impact the MD 390 corridor traffic between Spring Street and MD 410 in the AM and PM peak periods.

- Providing a right turn lane on NB MD 390 at the Purple Line Station access in **Options 2, 2A, and 3** appears to partially mitigate the impacts of losing the corridor's NB through lane.
- At the Purple Line Station intersection, removal of the SB left turn movement into the Station (**Options 1A and 2A**) makes the corridor traffic condition worse.
- At the 2nd Avenue intersection, allowing the NB right turn movement in **Option 3** (which is currently prohibited in the peak periods) contributes to the corridor traffic delay and queuing worsening, especially in the PM peak period.

Overall, Option 2 (which allows all movements at the Purple Line Station, along with a NB right turn lane, and prohibits peak period right turns at 2nd Avenue) appears to have the least negative impact to traffic operations of the Build options based on the described metrics.

Attachment 1A: Volume Diagrams for MD 390
Attachment 1B: Volume Diagrams for MD 97
Attachment 2A: VISSIM Network Performance
Attachment 2B: MD 390 Intersection VISSIM LOS/Delays/Queues for AM
Attachment 2C: MD 390 Intersection VISSIM LOS/Delays/Queues for PM

cc: Lindsay Bobian, Team Leader, Highway Design Division
Jeff Davis, Deputy Director, Office of Highway Development
Qianyu Hu, Assistant Division Chief for Traffic, District 3
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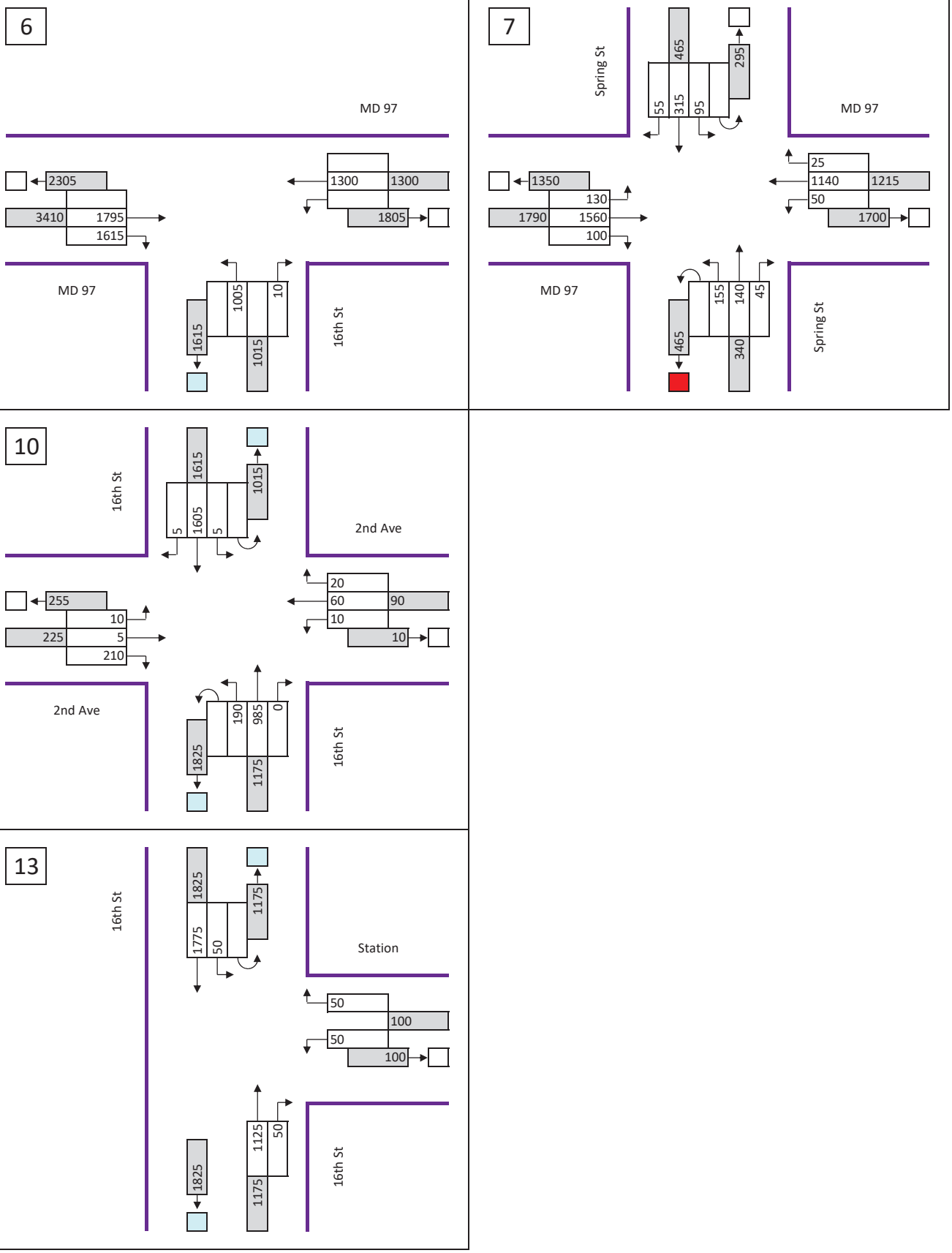
David Schlie, Regional Planner, Regional and Intermodal Planning Division
Randall Scott, Traffic Engineer, District 3 Traffic

Attachment 1A: MD 390 2040 AM w/o NBR at 2nd Ave - No Build, Option 1, and Option 2



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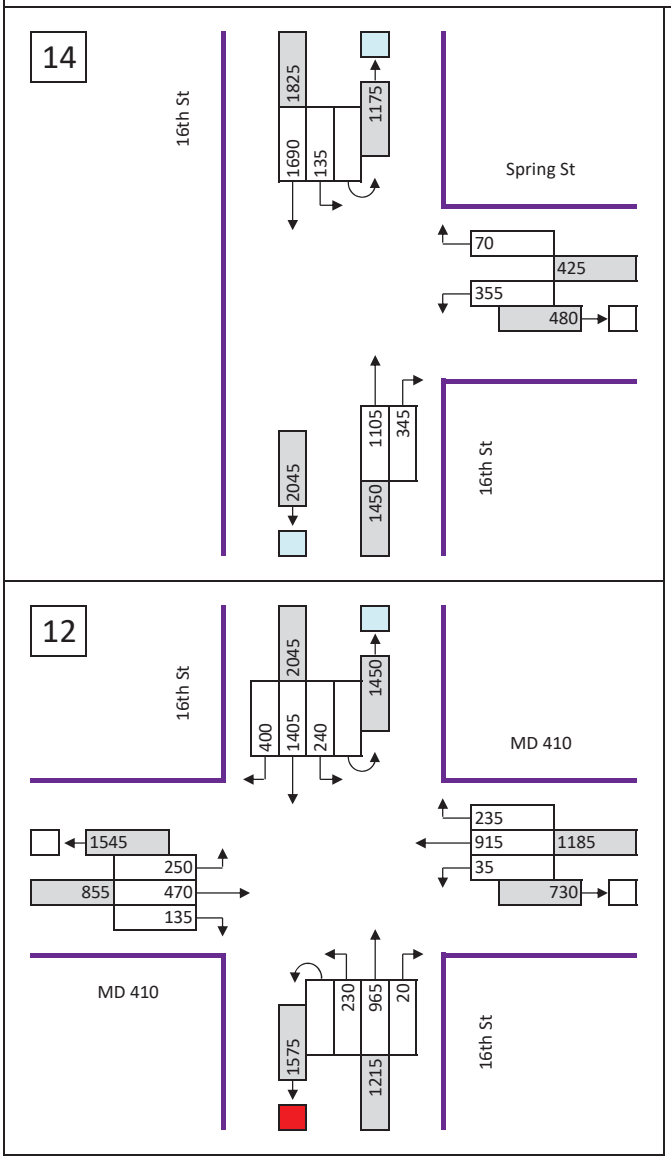
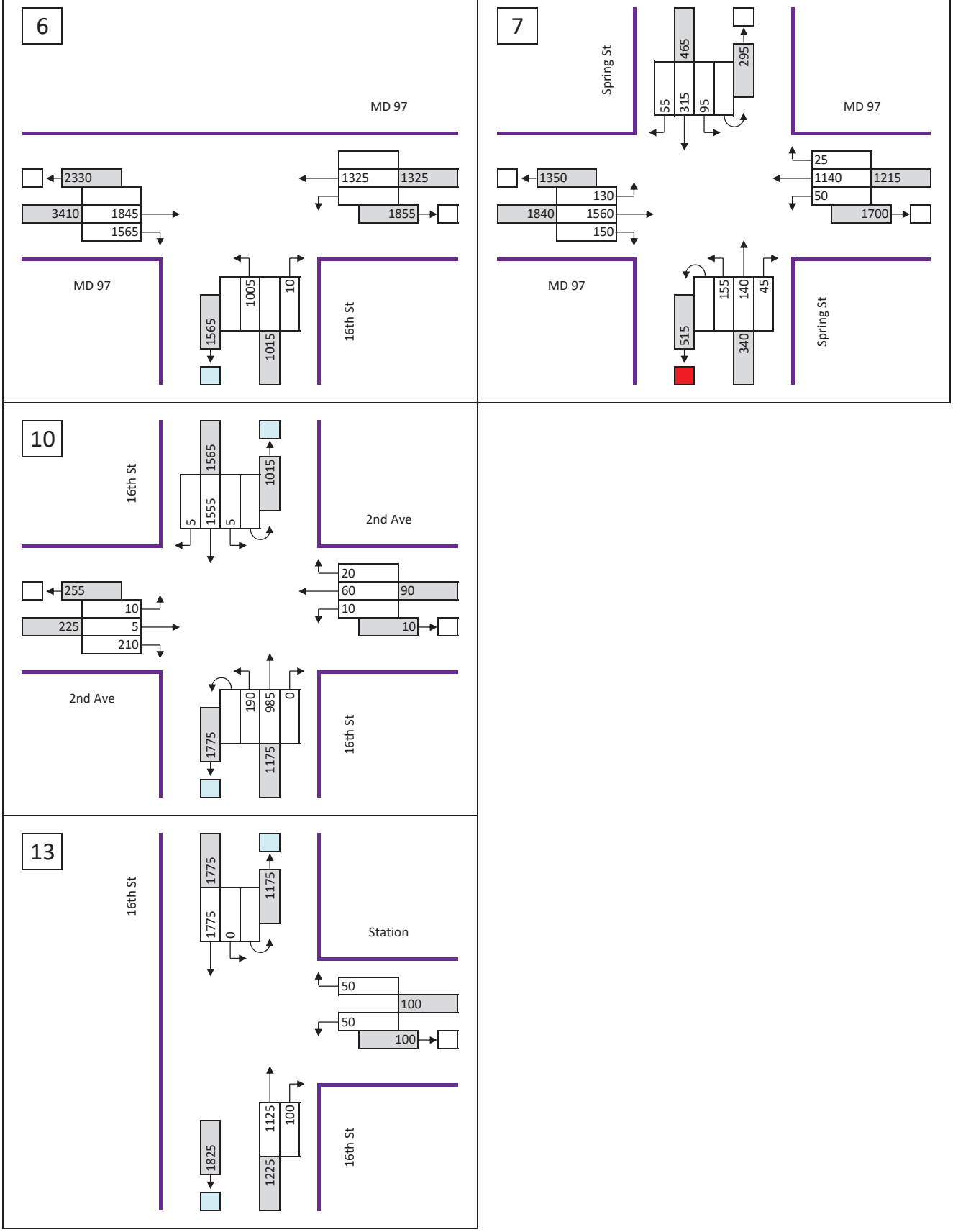


Attachment 1A: MD 390 2040 AM w/o NBR at 2nd Ave - Options 1A and 2A



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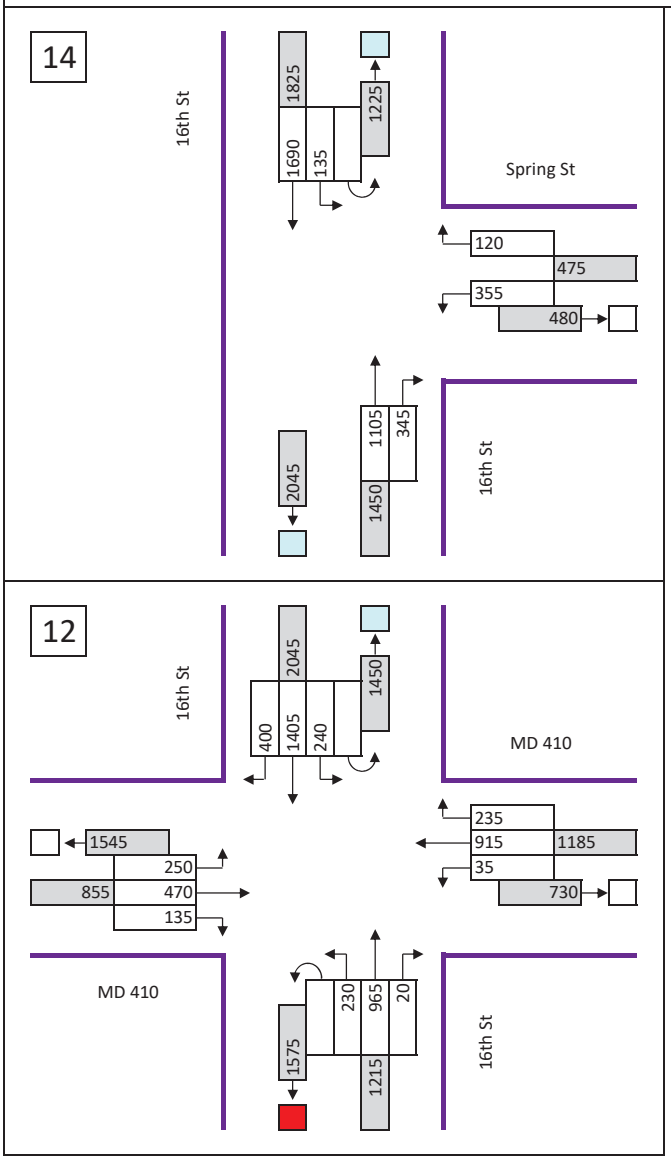
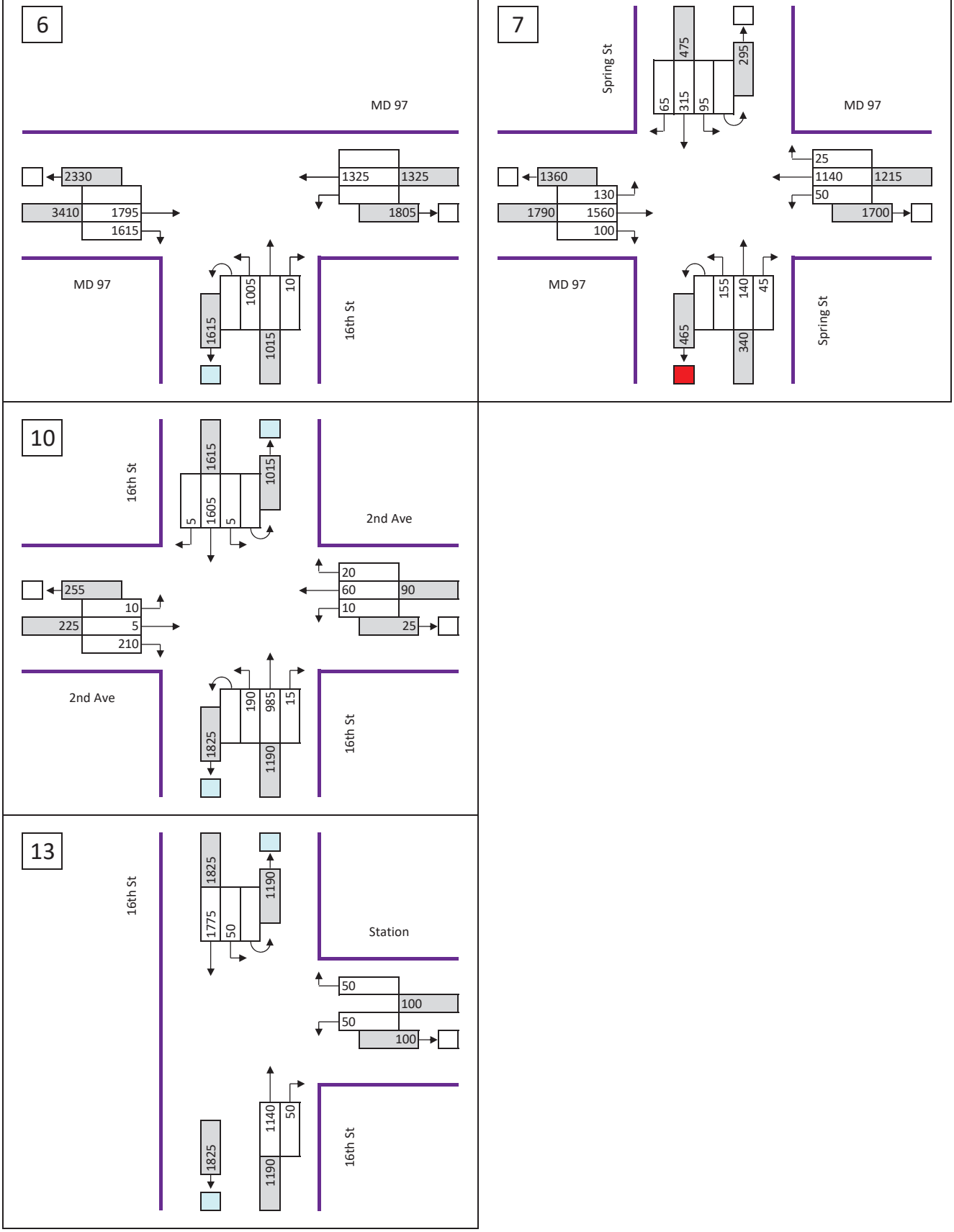


Attachment 1A: MD 390 2040 AM with NBR at 2nd Ave - Option 3



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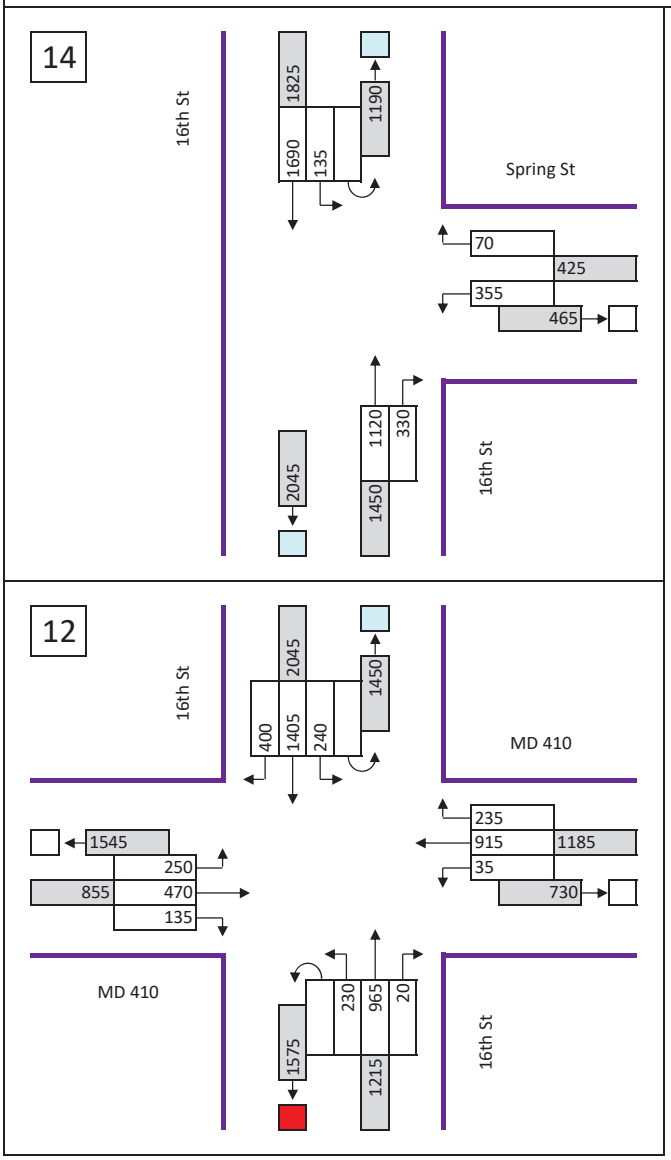
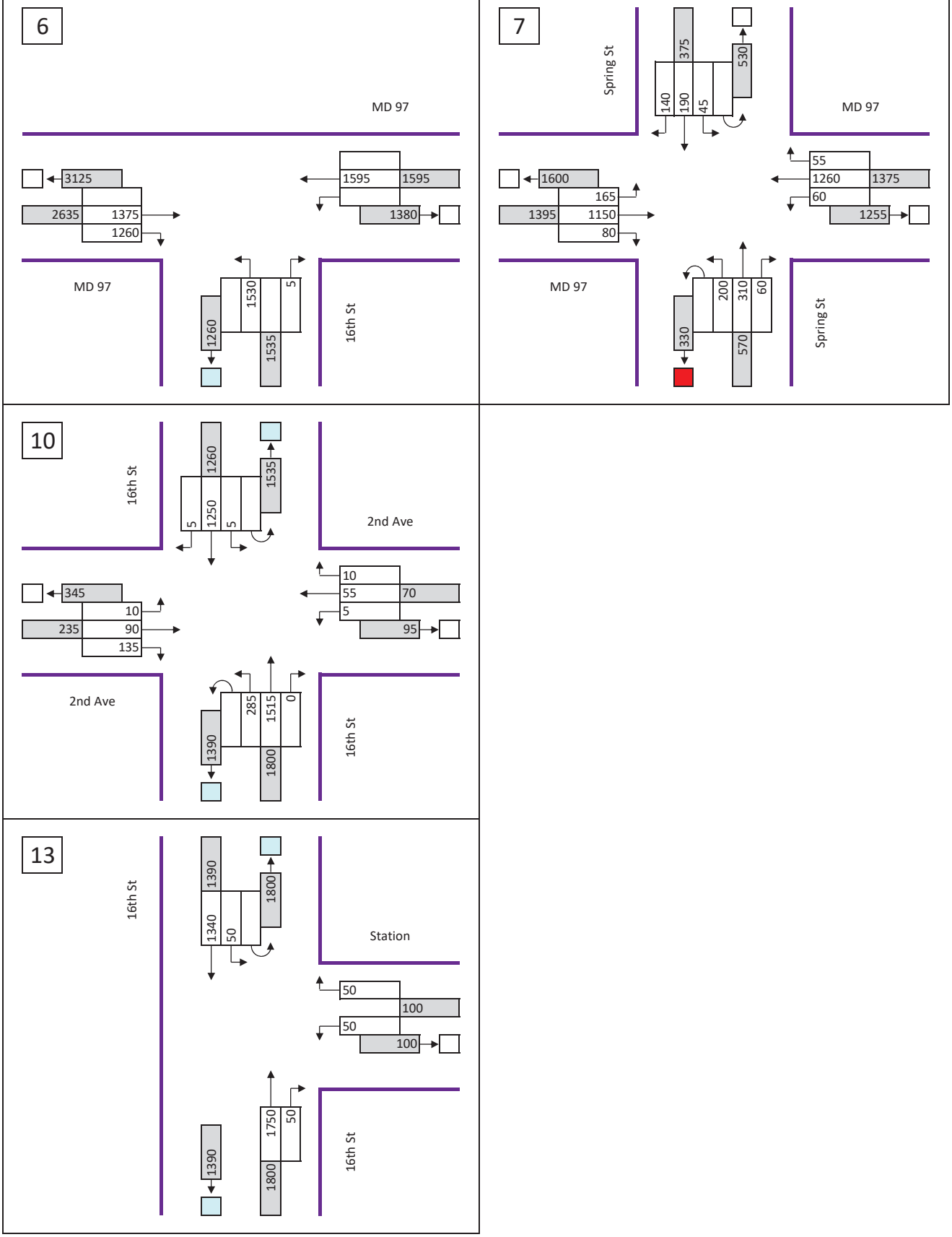
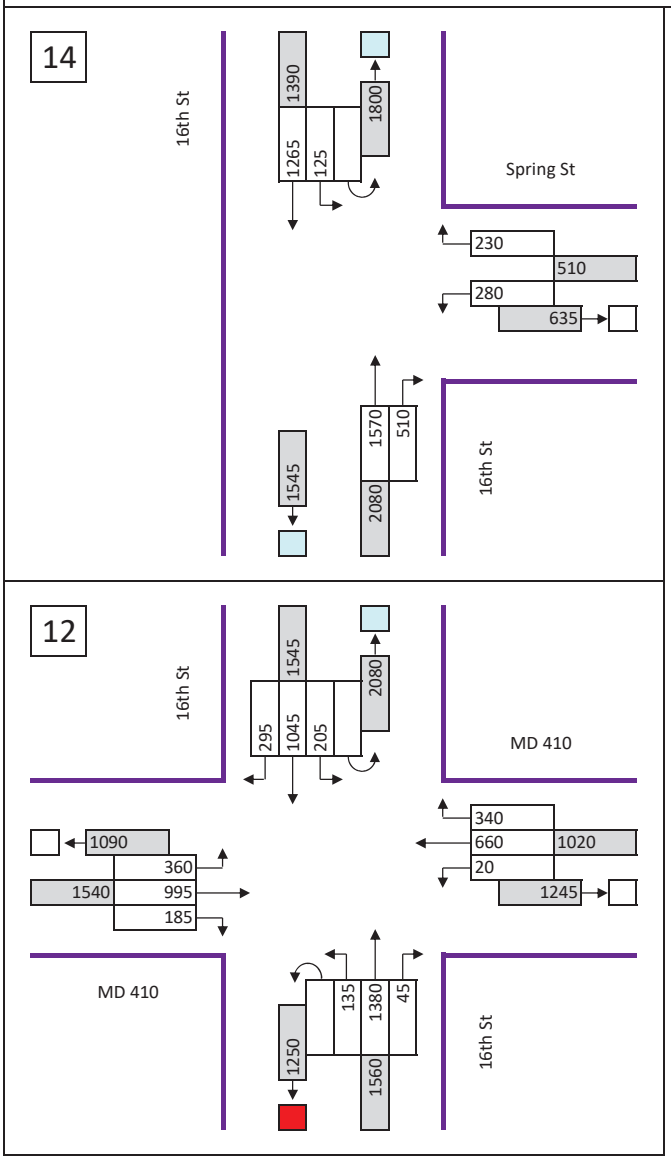


Attachment 1A: MD 390 2040 PM w/o NBR at 2nd Ave - No Build, Option 1, and Option 2



Attachment 1A: MD 390 2040 PM w/o NBR at 2nd Ave - No Build, Option 1, and Option 2



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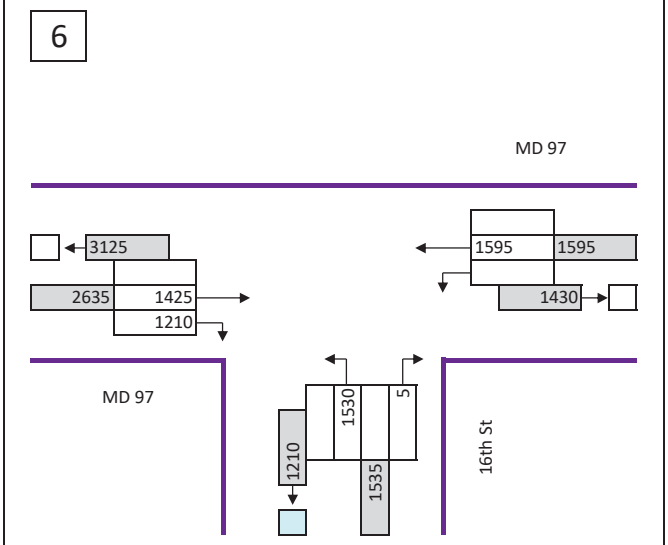

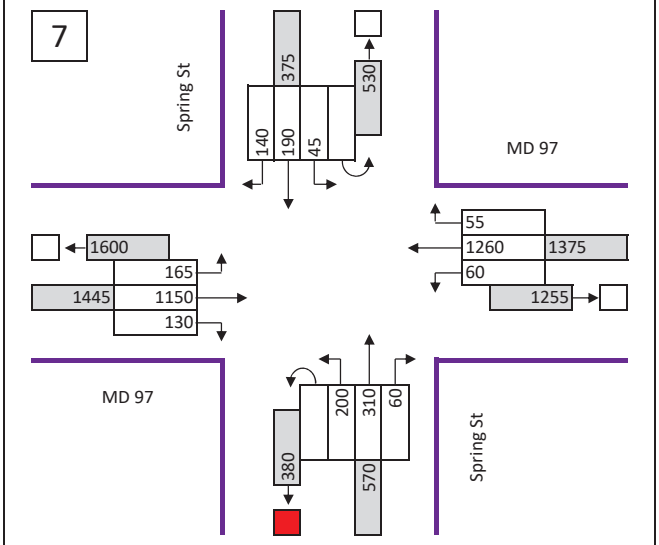

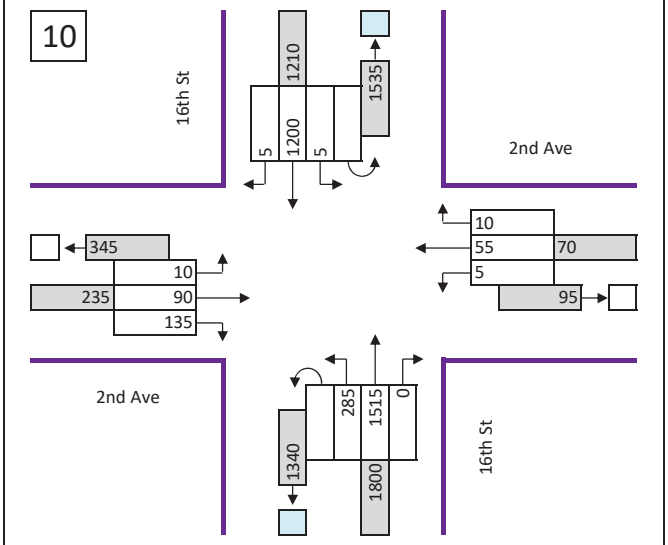

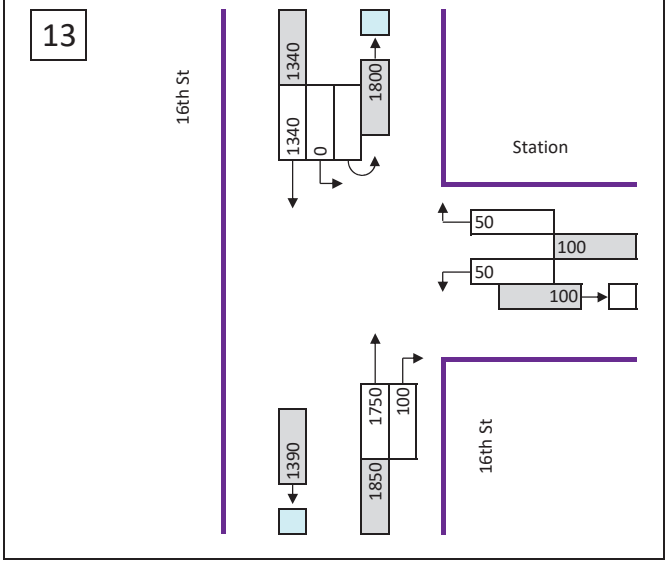

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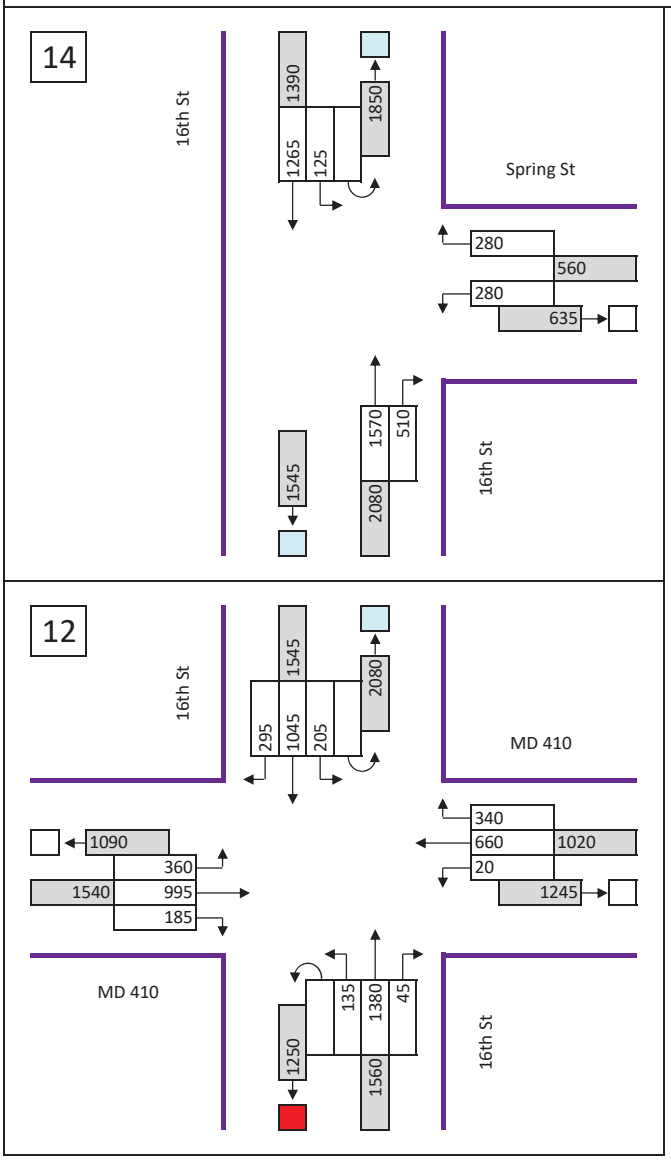
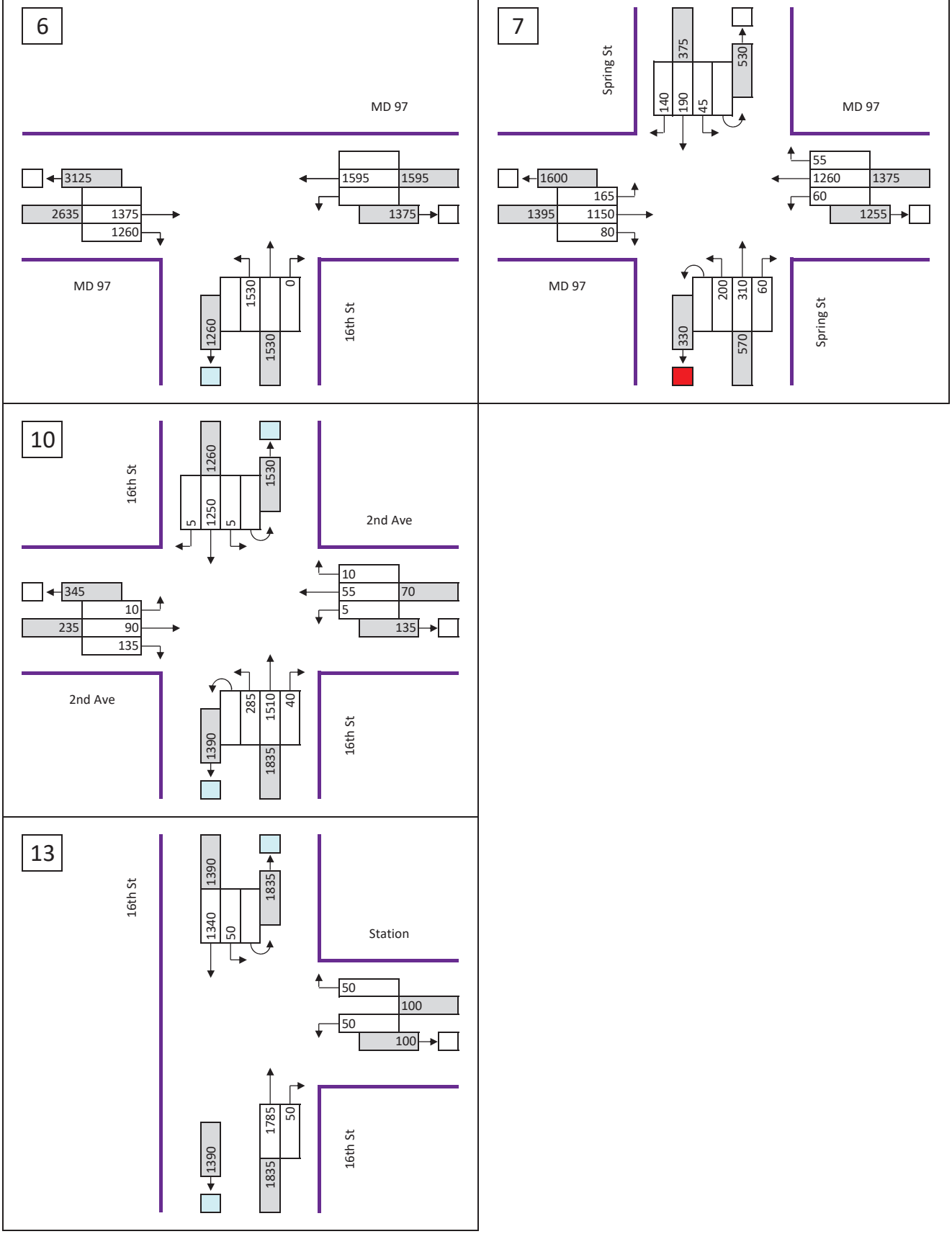


Attachment 1A: MD 390 2040 PM with NBR at 2nd Ave - Option 3



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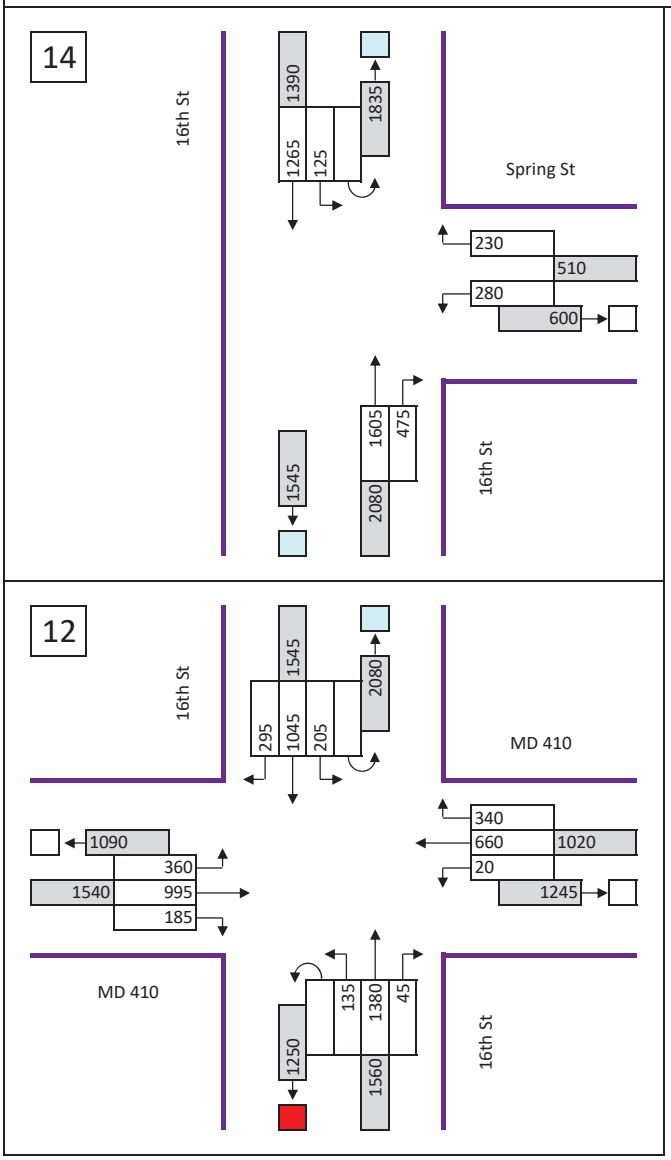
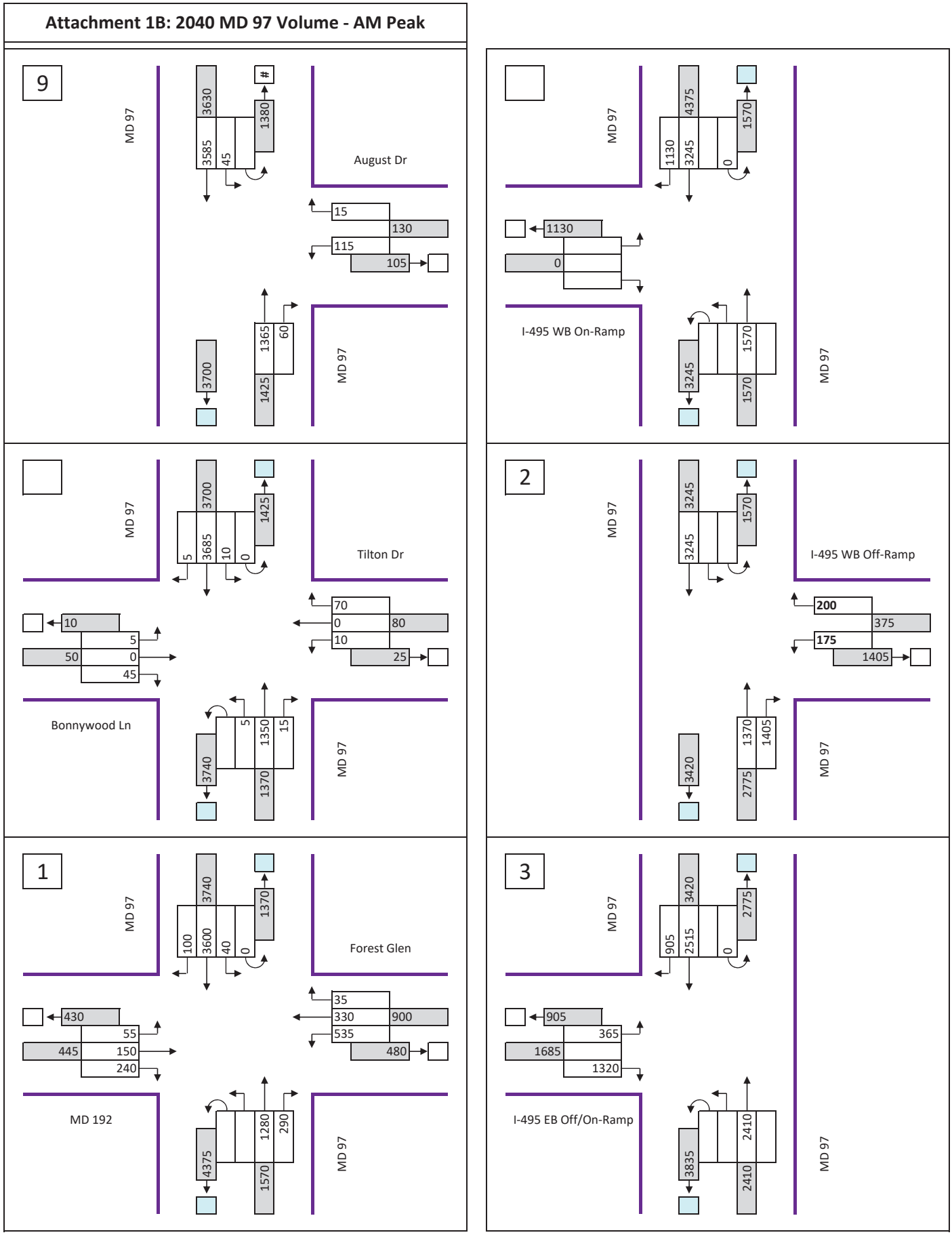
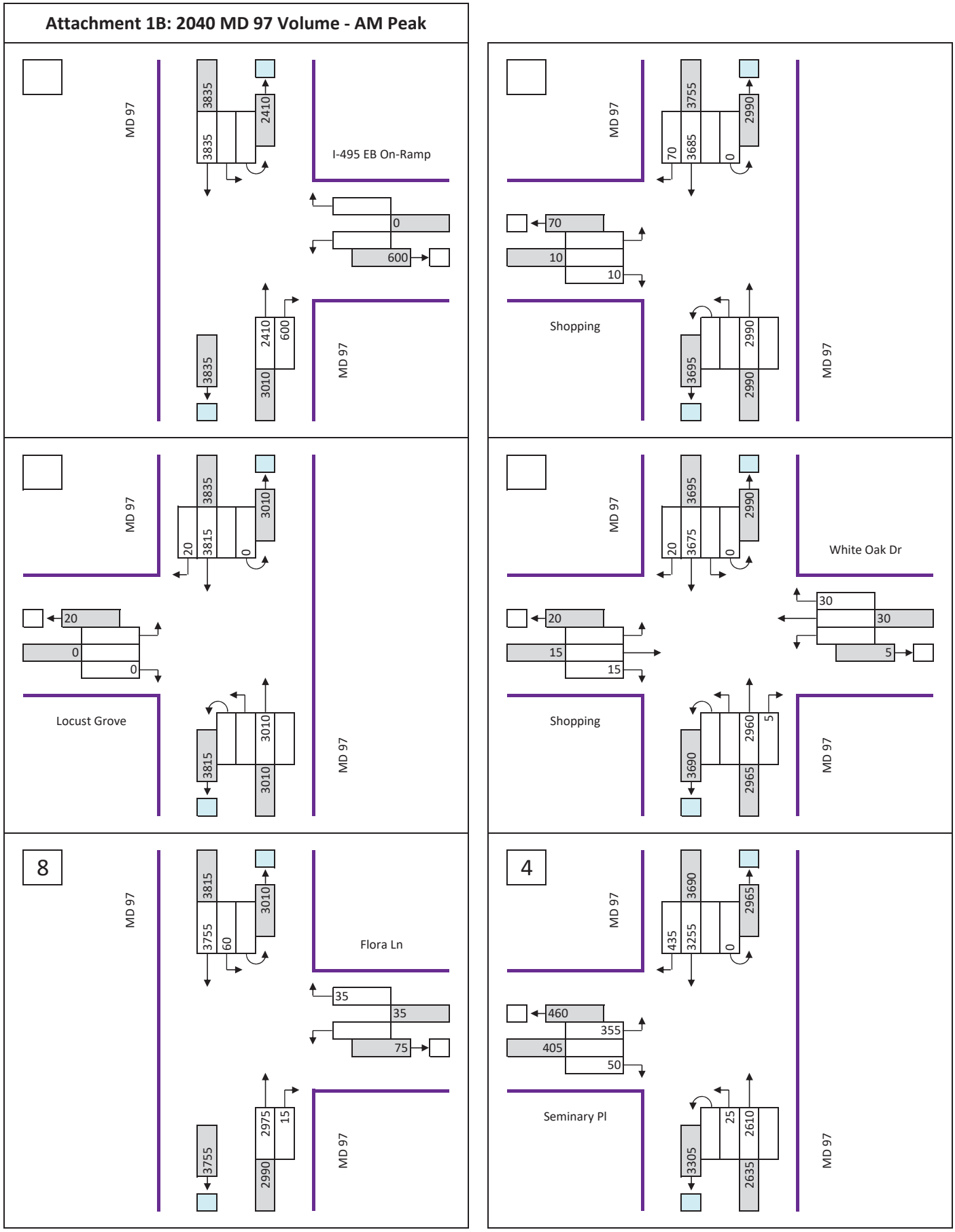


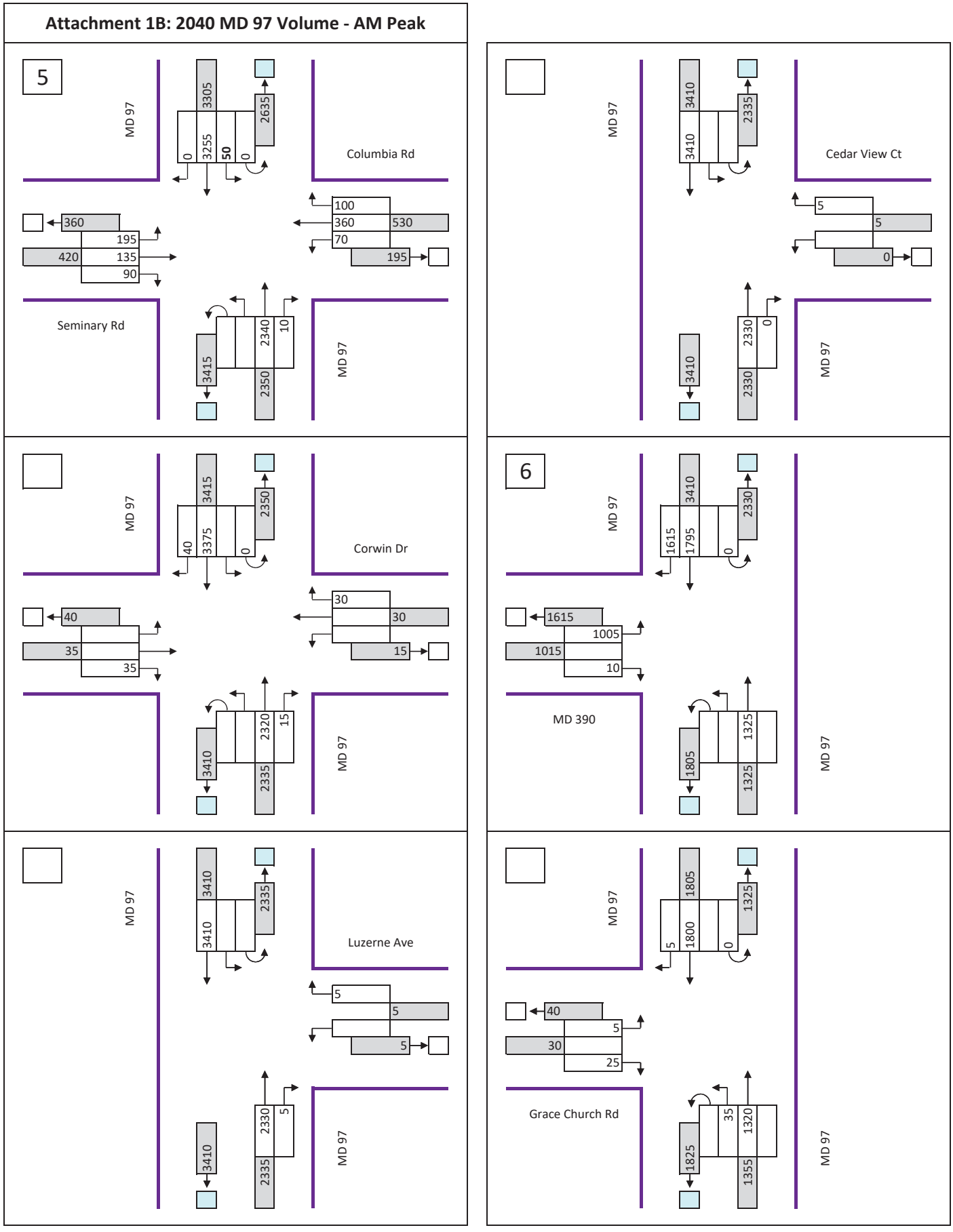
Attachment 1B: 2040 MD 97 Volume - AM Peak



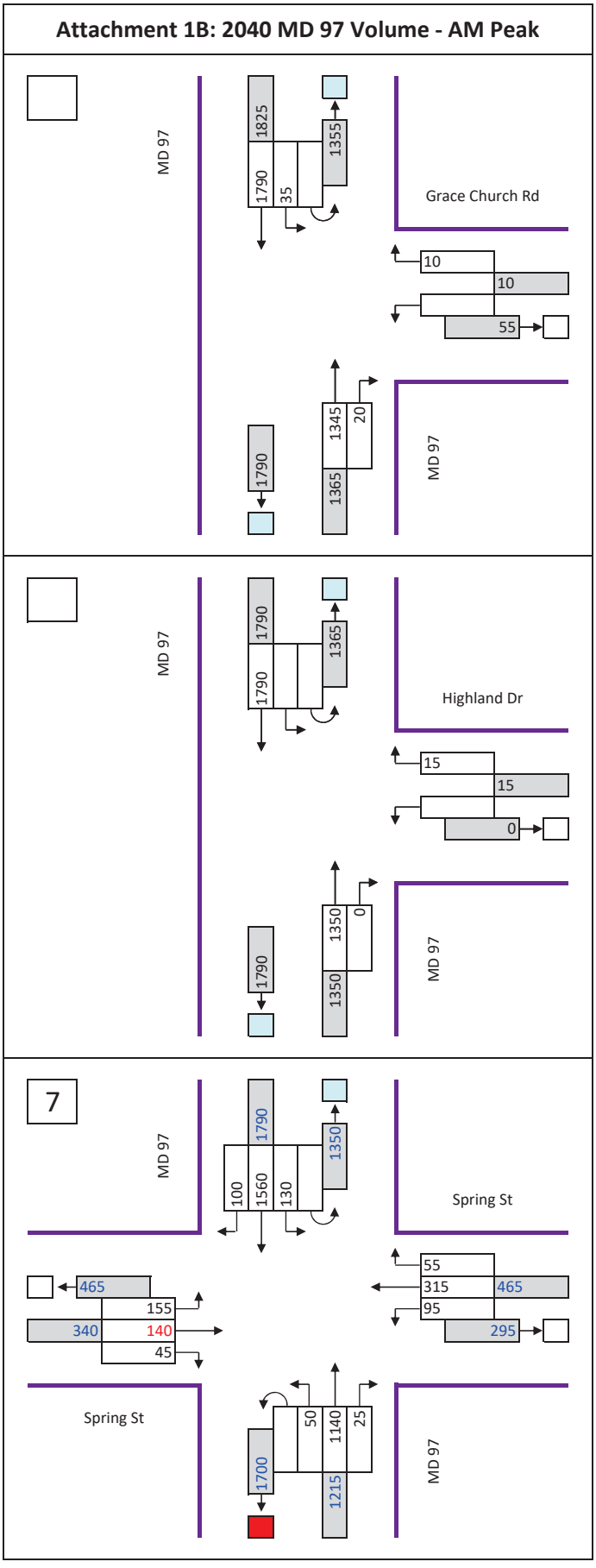
Attachment 1B: 2040 MD 97 Volume - AM Peak



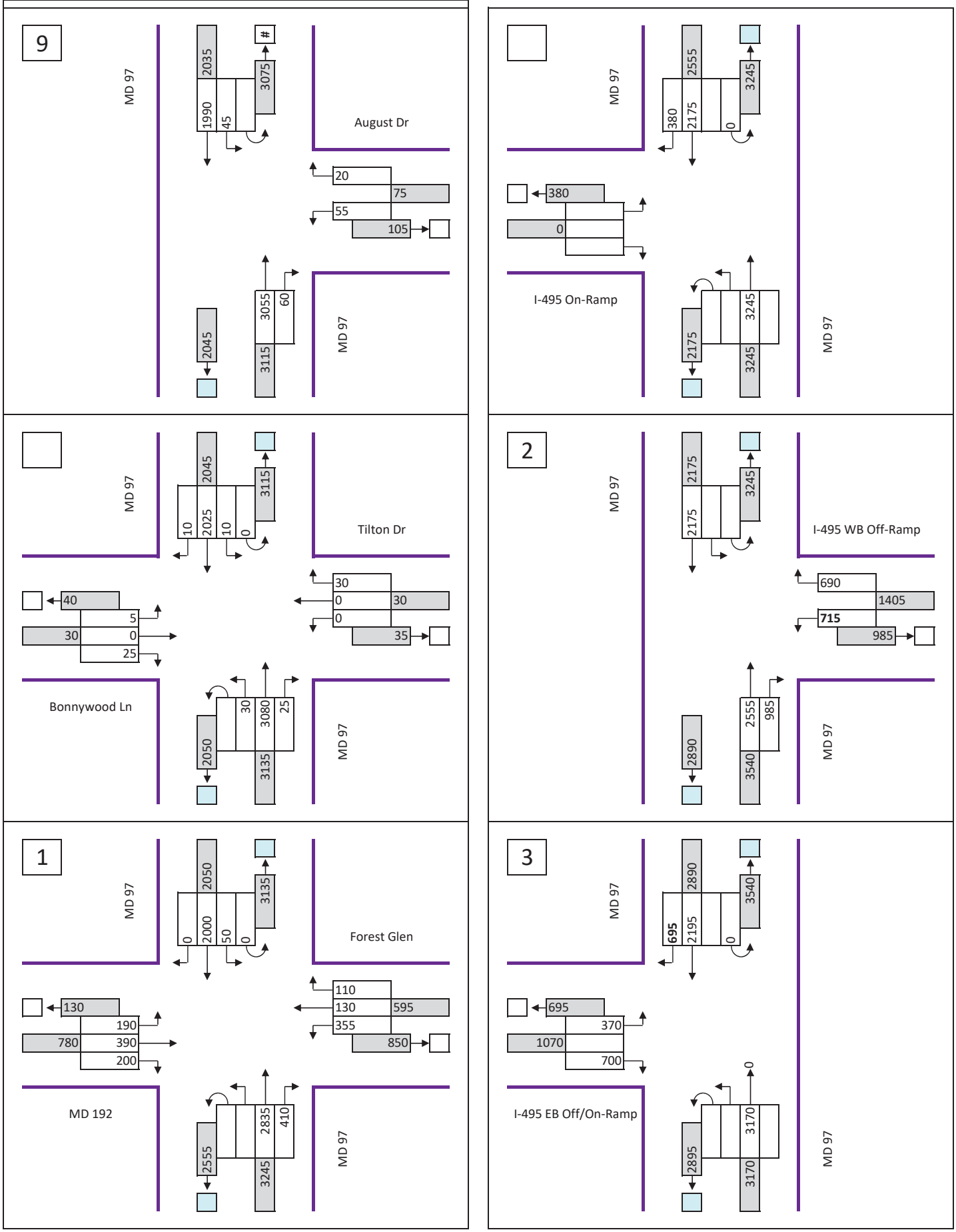
Attachment 1B: 2040 MD 97 Volume - AM Peak



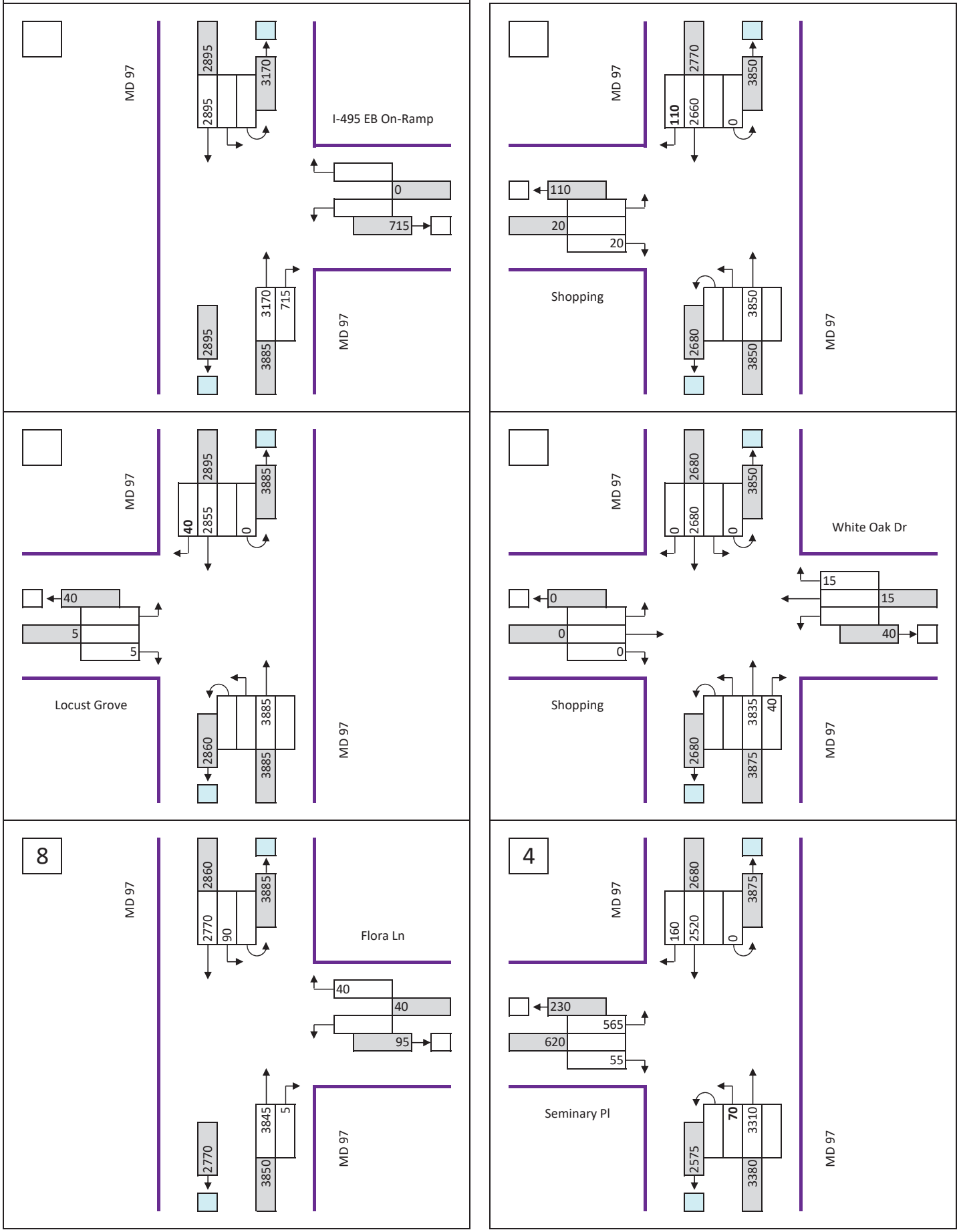
Attachment 1B: 2040 MD 97 Volume - AM Peak



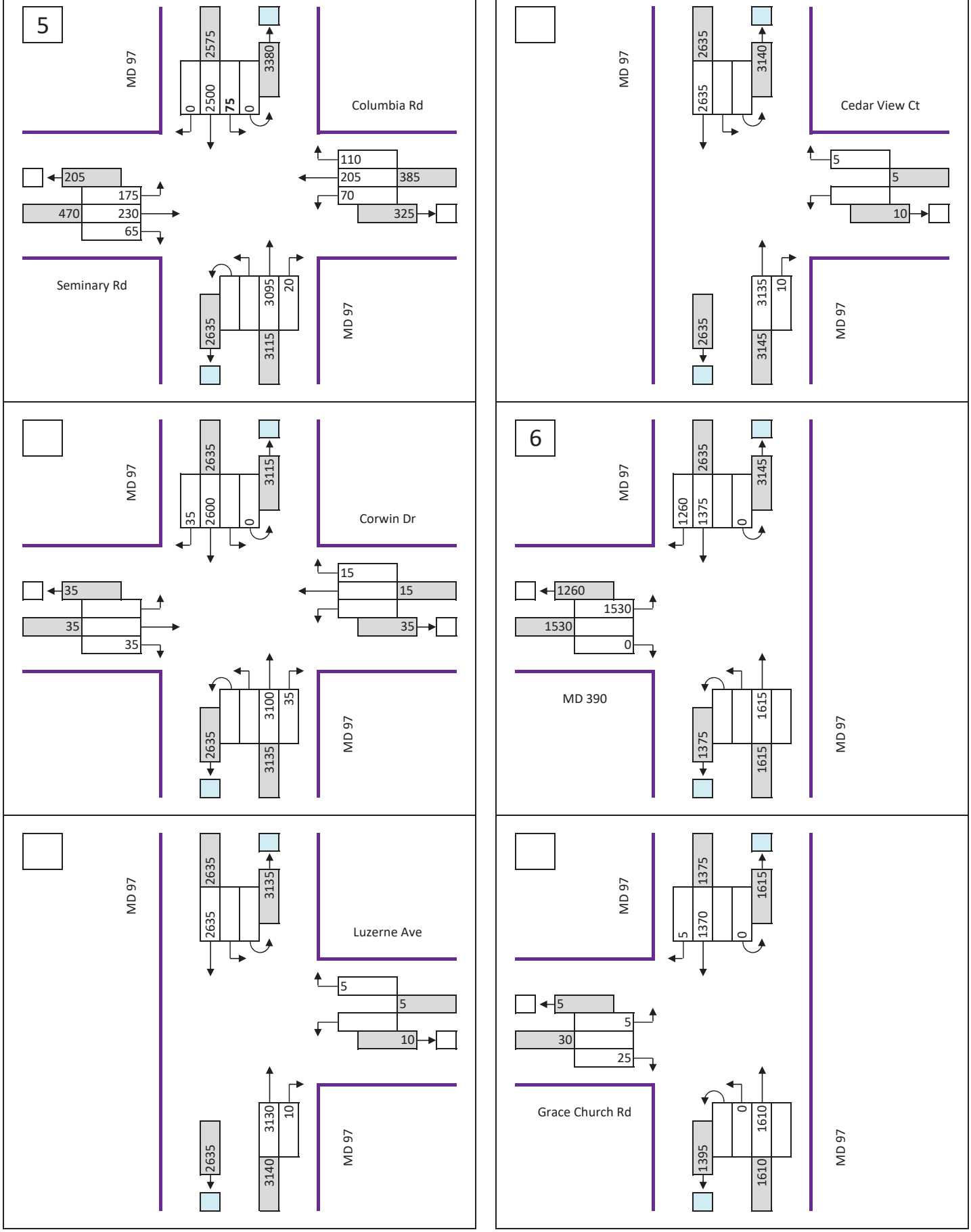
Attachment 1B: 2040 MD 97 Volume - PM Peak



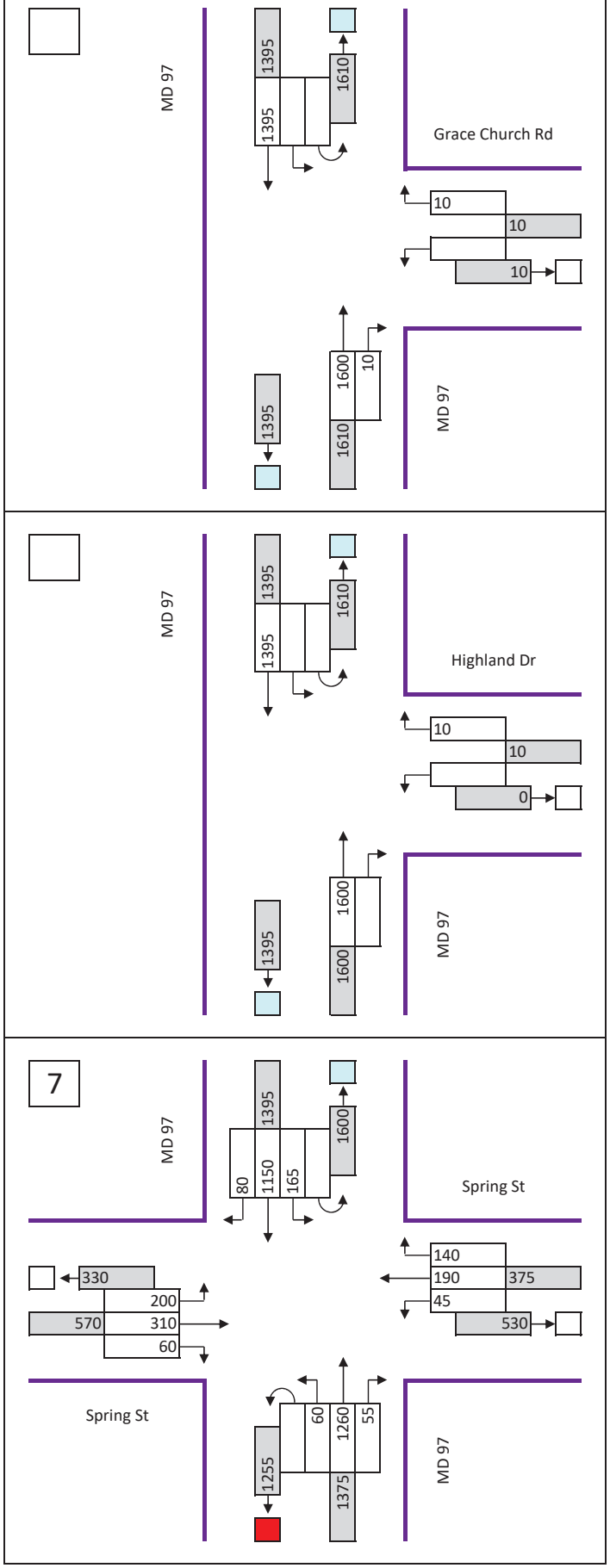
Attachment 1B: 2040 MD 97 Volume - PM Peak



Attachment 1B: 2040 MD 97 Volume - PM Peak



Attachment 1B: 2040 MD 97 Volume - PM Peak



Attachment 2A: Network Performance

Scenario Analyzed	In-Network Delay (Hours)	Out of Network (Latent) Delay (Hours)	Total Delay (Hours)	Change in Total Delay Compared to No Build	Latent Demand (Vehicles)
AM Peak Hour					
2040 No Build	969	10	979	--	84
2040 Build Option 1	994	6	1000	2%	60
2040 Build Option 1A	990	8	999	2%	65
2040 Build Option 2	989	10	999	2%	89
2040 Build Option 2A	1010	7	1017	4%	71
2040 Build Option 3	1002	8	1010	3%	83
PM Peak Hour					
2040 No Build	710	10	720	--	15
2040 Build Option 1	753	22	775	8%	45
2040 Build Option 1A	761	24	784	9%	59
2040 Build Option 2	763	4	767	7%	4
2040 Build Option 2A	758	30	789	10%	105
2040 Build Option 3	798	13	811	13%	28

Notes:

1. All scenarios include the future MD 97 corridor improvements with the I-495 Interchange and the MD 390 intersection.
2. All Build Options inlcude the bicycle crossings at Spring St, Purple Line Station, and 2nd Avenue across the side street of MD 390 NB.
3. The crosswalks across MD 390 are added at 2nd Avenue and Spring Street for all of the scenarios. The MD 390 crosswalk at Purple Line Station access is added to the Build options only.
4. Averages over five runs were used.
5. Models were updated with Vissim 2022 SP13.

Analysis Options (Combinations of Scenarios)

Build Options	Purple Line Station Access	2nd Ave.	Spring St.
Option 1:	#2	#2	#2
Option 1A:	#2, #4	#2	#2
Option 2:	#3	#2	#2
Option 2A:	#3, #4	#2	#2
Option 3:	#3	#3	#2

Spring Street intersection Scenarios

#1. No-Build

#2. Build w/ NB right turn lane (current design) and a signal phase for the NB/SB bicycles on the bike lanes that will stop all MD 390 SB lefts and NB rights. Need to know queue distances for the turn lanes.

Purple Line Station intersection Scenarios

#1. No-Build

#2. Build w/ no NB right turn lane (current design) and a signal phase for NB/SB bicycles on the bike lanes that will stop all MD 390 SB lefts and NB traffic (thru and right).

#3. Build w/ NB right turn lane (approximately **100 ft**) and a signal phase for the NB/SB bicycles on the bike lanes that will stop all MD 390 SB lefts and NB rights. Need to know queue distances for the turn lanes.

#4. #2 and #3 with the SB left not allowed per the MTA Purple Line plans.

2nd Avenue intersection Scenarios

#1. No-Build

#2. Build w/ no NB right turn lane (current design) and NB right turns prohibited in peaks with a signal phase for NB/SB bicycles on bike lanes.

#3. Build w/ no NB right turn lane (current design) and NB right turns allowed in peaks with a signal phase for NB/SB bicycles on bike lanes (still stops SB lefts in peaks/off-peak and NB traffic in non-peaks).

Attachment 2B: Intersection VISSIM LOS/Delays - AM Peak

No Build

Intersection	Mvmt.	Avg. Queue (ft)	Max. Queue (ft)	Vehs (All)	Veh% of Input Volume	Avg. Veh. Delay (All)
MD 390 at MD 97	SBR	80	917	1483	92%	11.7
	SBT	80	917	1701	95%	14.6
	EBR	72	377	10	100%	26.5
	EBL	72	377	986	98%	27.1
	NBT	36	432	1298	100%	12.7
	All			**5478**	**96%**	**15.6**
MD 390 at 2nd Ave	EBL	130	448	10	100%	84.6
	EBT	130	448	3	60%	73.6
	EBR	130	448	218	104%	83.5
	WBR	29	193	21	105%	49.9
	WBT	29	193	58	97%	50.5
	WBL	29	193	12	120%	42.0
	SBR	136	627	5	100%	32.6
	SBL	136	627	4	80%	33.2
	SBT	136	627	1473	92%	32.8
	NBL	77	290	170	89%	69.6
	NBT	11	124	966	98%	6.0
	NBR	11	124	0	#DIV/0!	0.0
	All			**2940**	**95%**	**30.7**
MD 390 at Purple Line Station Acc.	NBT	11	166	1085	96%	3.3
	NBR	11	166	50	100%	4.3
	SBT	13	462	1656	93%	3.7
	SBL	13	462	46	92%	10.2
	WBR	32	109	48	96%	50.0
	WBL	32	109	49	98%	51.2
	All			**2935**	**95%**	**5.2**
MD 390 at Spring Ave	NBT	33	442	1069	97%	10.2
	NBR	7	316	340	99%	7.4
	WBR	0	37	69	99%	33.7
	WBL	127	453	360	101%	95.0
	SBT	61	516	1568	93%	14.7
	SBL	61	516	129	96%	19.3
	All			**3535**	**96%**	**21.4**
MD 390 at MD 410	NBT	153	470	947	98%	39.2
	NBR	97	448	23	115%	30.5
	NBL	153	470	245	107%	88.3
	WBR	68	327	216	92%	173.7
	WBL	1171	2165	36	103%	210.2
	WBT	1171	2165	867	95%	222.4
	SBT	288	760	1317	94%	39.9
	SBL	288	760	227	95%	44.0
	SBR	57	559	379	95%	18.8
	EBL	185	656	247	99%	101.3
	EBR	185	656	138	102%	48.5
	EBT	185	656	472	100%	30.3
	ALL			**5114**	**96%**	**80.8**

Build Option 1

Intersection	Mvmt.	Avg. Queue (ft)	Max. Queue (ft)	Vehs (All)	Veh% of Input Volume	Avg. Veh. Delay (All)
MD 390 at MD 97	SBR	82	863	1482	92%	11.3
	SBT	82	863	1698	95%	15.5
	EBR	97	557	10	100%	31.4
	EBL	97	557	980	98%	32.7
	NBT	37	467	1298	100%	13.4
	All			**5468**	**96%**	**17.0**
MD 390 at 2nd Ave	EBL	125	439	10	100%	80.7
	EBT	125	439	3	60%	58.5
	EBR	125	439	216	103%	80.6
	WBR	30	195	21	105%	47.3
	WBT	30	195	58	97%	52.0
	WBL	30	195	12	120%	47.6
	SBR	79	500	5	100%	25.2
	SBL	79	500	4	80%	32.9
	SBT	79	500	1475	92%	20.0
	NBL	77	331	169	89%	70.3
	NBT	6	173	959	97%	3.6
	NBR	6	173	0	#DIV/0!	0.0
	All			**2932**	**94%**	**23.2**
MD 390 at Purple Line Station Acc.	NBT	41	344	1080	96%	10.1
	NBR	41	344	50	100%	13.2
	SBT	60	615	1659	93%	12.2
	SBL	60	615	45	90%	23.0
	WBR	32	109	48	96%	51.5
	WBL	32	109	49	98%	51.1
	All			**2932**	**95%**	**12.9**
MD 390 at Spring Ave	NBT	125	568	1068	97%	29.5
	NBR	74	529	340	99%	24.7
	WBR	125	473	68	97%	78.7
	WBL	125	473	360	101%	83.4
	SBT	99	549	1575	93%	21.0
	SBL	99	549	129	96%	45.4
	All			**3541**	**96%**	**32.2**
MD 390 at MD 410	NBT	293	729	931	96%	82.2
	NBR	238	716	23	115%	57.3
	NBL	293	729	244	106%	136.4
	WBR	61	303	217	92%	122.1
	WBL	875	1982	36	103%	173.8
	WBT	875	1982	872	95%	171.1
	SBT	270	750	1322	94%	37.7
	SBL	270	750	228	95%	41.5
	SBR	38	471	383	96%	14.8
	EBL	234	818	248	99%	121.8
	EBR	234	818	136	101%	52.5
	EBT	234	818	468	100%	34.1
	ALL			**5108**	**96%**	**79.9**

Build Option 1A

Intersection	Mvmt.	Avg. Queue (ft)	Max. Queue (ft)	Vehs (All)	Veh% of Input Volume	Avg. Veh. Delay (All)
MD 390 at MD 97	SBR	82	943	1435	92%	11.1
	SBT	82	943	1750	95%	15.2
	EBR	107	583	10	100%	36.9
	EBL	107	583	981	98%	35.2
	NBT	37	407	1300	100%	12.7
	All			**5477**	**96%**	**17.1**
MD 390 at 2nd Ave	EBL	126	439	10	100%	84.4
	EBT	126	439	3	60%	63.3
	EBR	126	439	216	103%	81.1
	WBR	29	195	21	105%	47.3
	WBT	29	195	58	97%	51.7
	WBL	29	195	12	120%	47.6
	SBR	72	521	5	100%	18.7
	SBL	72	521	4	80%	19.0
	SBT	72	521	1425	92%	19.0
	NBL	76	394	171	90%	66.8
	NBT	7	241	961	98%	3.7
	NBR	7	241	0	#DIV/0!	0.0
	All			**2887**	**95%**	**22.7**
MD 390 at Purple Line Station Acc.	NBT	47	379	1090	97%	10.7
	NBR	47	379	102	102%	13.0
	SBT	52	589	1654	93%	12.1
	SBL	#N/A	#N/A	#N/A	#N/A	#N/A
	WBR	32	109	48	96%	51.0
	WBL	32	109	49	98%	51.4
	All			**2944**	**95%**	**13.0**
MD 390 at Spring Ave	NBT	103	607	1075	97%	24.7
	NBR	51	536	344	100%	19.3
	WBR	136	429	125	104%	78.7
	WBL	136	429	352	99%	77.0
	SBT	113	594	1573	93%	24.4
	SBL	113	594	129	96%	50.9
	All			**3598**	**96%**	**32.0**
MD 390 at MD 410	NBT	266	764	937	97%	73.1
	NBR	191	761	23	115%	56.4
	NBL	266	764	241	105%	134.0
	WBR	67	324	221	94%	130.6
	WBL	880	1744	36	103%	168.3
	WBT	880	1744	878	96%	173.2
	SBT	276	764	1317	94%	39.8
	SBL	276	764	228	95%	47.5
	SBR	52	430	376	94%	17.9
	EBL	244	848	247	99%	128.0
	EBR	244	848	138	102%	54.8
	EBT	244	848	472	100%	36.3
	ALL			**5114**	**96%**	**80.4**

Build Option 2

Intersection	Mvmt.	Avg. Queue (ft)	Max. Queue (ft)	Vehs (All)	Veh% of Input Volume	Avg. Veh. Delay (All)
MD 390 at MD 97	SBR	76	844	1476	91%	10.7
	SBT	76	844	1692	94%	14.6
	EBR	99	573	10	100%	29.5
	EBL	99	573	989	98%	33.3
	NBT	39	433	1296	100%	13.8
	All			**5462**	**95%**	**16.8**
MD 390 at 2nd Ave	EBL	127	443	10	100%	84.5
	EBT	127	443	3	60%	58.5
	EBR	127	443	216	103%	82.0
	WBR	30	195	21	105%	47.3
	WBT	30	195	58	97%	52.0
	WBL	30	195	12	120%	47.6
	SBR	74	501	5	100%	17.3
	SBL	74	501	4	80%	35.9
	SBT	74	501	1469	92%	19.3
	NBL	84	485	172	91%	70.8
	NBT	9	252	969	98%	5.5
	NBR	9	252	0	#DIV/0!	0.0
	All			**2938**	**95%**	**23.6**
MD 390 at Purple Line Station Acc.	NBT	21	300	1092	97%	5.3
	NBR	21	300	50	100%	11.7
	SBT	62	610	1652	93%	12.7
	SBL	62	610	45	90%	20.4
	WBR	32	109	48	96%	50.8
	WBL	32	109	49	98%	51.4
	All			**2938**	**95%**	**11.3**
MD 390 at Spring Ave	NBT	102	521	1081	98%	24.7
	NBR	53	508	344	100%	19.4
	WBR	95	384	68	97%	64.6
	WBL	95	384	362	102%	63.0
	SBT	97	562	1560	92%	20.5
	SBL	97	562	129	96%	45.4
	All			**3543**	**96%**	**27.8**
MD 390 at MD 410	NBT	146	499	945	98%	37.5
	NBR	94	465	23	115%	29.6
	NBL	146	499	246	107%	82.8
	WBR	65	318	220	94%	131.7
	WBL	867	1714	36	103%	175.9
	WBT	867	1714	885	97%	173.0
	SBT	244	752	1311	93%	37.8
	SBL	244	752	226	94%	38.7
	SBR	43	481	380	95%	15.8
	EBL	274	800	244	98%	133.7
	EBR	274	800	139	103%	60.4
	EBT	274	800	474	101%	45.0
	ALL			**5130**	**97%**	**72.0**

Build Option 2A

Intersection	Mvmt.	Avg. Queue (ft)	Max. Queue (ft)	Vehs (All)	Veh% of Input Volume	Avg. Veh. Delay (All)
MD 390 at MD 97	SBR	90	963	1423	91%	11.0
	SBT	90	963	1744	95%	15.8
	EBR	109	581	10	100%	37.7
	EBL	109	581	991	99%	36.0
	NBT	37	435	1308	101%	13.2
	All			**5477**	**96%**	**17.6**
MD 390 at 2nd Ave	EBL	125	439	10	100%	80.7
	EBT	125	439	3	60%	62.7
	EBR	125	439	216	103%	80.6
	WBR	30	195	21	105%	47.3
	WBT	30	195	58	97%	52.0
	WBL	30	195	12	120%	47.6
	SBR	71	509	5	100%	19.3
	SBL	71	509	4	80%	24.4
	SBT	71	509	1421	91%	19.4
	NBL	75	378	172	91%	65.5
	NBT	14	304	975	99%	5.7
	NBR	14	304	0	#DIV/0!	0.0
	All			**2897**	**95%**	**23.4**
MD 390 at Purple Line Station Acc.	NBT	26	333	1097	98%	6.2
	NBR	26	333	103	103%	11.0
	SBT	52	568	1650	93%	11.9
	SBL	#N/A	#N/A	#N/A	#N/A	#N/A
	WBR	32	109	48	96%	50.8
	WBL	32	109	49	98%	51.4
	All			**2947**	**95%**	**11.1**
MD 390 at Spring Ave	NBT	125	582	1085	98%	30.1
	NBR	74	545	347	101%	26.0
	WBR	139	438	125	104%	81.8
	WBL	139	438	352	99%	78.5
	SBT	115	625	1565	93%	24.5
	SBL	115	625	128	95%	50.0
	All			**3603**	**96%**	**34.4**
MD 390 at MD 410	NBT	150	452	947	98%	39.7
	NBR	97	418	23	115%	30.3
	NBL	150	452	241	105%	82.5
	WBR	68	305	212	90%	187.1
	WBL	1246	2275	34	97%	222.1
	WBT	1246	2275	850	93%	233.4
	SBT	265	769	1311	93%	39.0
	SBL	265	769	227	95%	41.2
	SBR	40	415	374	94%	15.7
	EBL	217	731	251	100%	114.7
	EBR	217	731	138	102%	51.8
	EBT	217	731	473	101%	34.3
	ALL			**5081**	**96%**	**83.1**

Build Option 3

Intersection	Mvmt.	Avg. Queue (ft)	Max. Queue (ft)	Vehs (All)	Veh% of Input Volume	Avg. Veh. Delay (All)
MD 390 at MD 97	SBR	80	868	1477	91%	11.3
	SBT	80	868	1697	95%	15.3
	EBR	99	526	10	100%	33.1
	EBL	99	526	981	98%	33.2
	NBT	38	475	1299	100%	13.4
	All			**5465**	**95%**	**17.0**
MD 390 at 2nd Ave	EBL	126	439	10	100%	84.3
	EBT	126	439	3	60%	62.7
	EBR	126	439	216	103%	81.2
	WBR	30	195	21	105%	47.3
	WBT	30	195	58	97%	52.0
	WBL	30	195	12	120%	47.6
	SBR	77	585	5	100%	19.6
	SBL	77	585	4	80%	28.6
	SBT	77	585	1467	91%	19.5
	NBL	79	400	171	90%	69.7
	NBT	9	251	957	97%	4.6
	NBR	9	251	15	100%	4.7
	All			**2939**	**94%**	**23.3**
MD 390 at Purple Line Station Acc.	NBT	23	273	1098	96%	5.7
	NBR	23	273	51	102%	9.7
	SBT	62	653	1651	93%	12.8
	SBL	62	653	45	90%	19.0
	WBR	32	109	48	96%	50.8
	WBL	32	109	49	98%	51.4
	All			**2943**	**94%**	**11.4**
MD 390 at Spring Ave	NBT	95	522	1088	97%	22.8
	NBR	47	475	328	99%	18.7
	WBR	88	353	68	97%	59.1
	WBL	88	353	362	102%	58.1
	SBT	102	600	1559	92%	21.3
	SBL	102	600	129	96%	50.1
	All			**3533**	**95%**	**27.1**
MD 390 at MD 410	NBT	182	653	936	97%	45.3
	NBR	119	645	23	115%	34.0
	NBL	182	653	242	105%	99.0
	WBR	64	286	216	92%	127.4
	WBL	914	1999	36	103%	169.6
	WBT	914	1999	868	95%	177.6
	SBT	237	737	1311	93%	37.9
	SBL	237	737	227	95%	39.1
	SBR	41	500	380	95%	14.5
	EBL	227	710	248	99%	116.8
	EBR	227	710	138	102%	53.0
	EBT	227	710	472	100%	35.7
	ALL			**5097**	**96%**	**73.1**

Input Volumes

Intersection	Mvmt.	NoBuild, Opt 1, Opt 2	Opt 1A, Opt 2A	Opt 3
MD 390 at MD 97	SBR	1615	1565	1615
	SBT	**1795**	**1845**	**1795**
	EBR	10	10	10
	EBL	1005	1005	1005
	NBT	**1300**	**1300**	**1300**
	All	**5725**	**5725**	**5725**
MD 390 at 2nd Ave	EBL	10	10	10
	EBT	5	5	5
	EBR	210	210	210
	WBR	20	20	20
	WBT	60	60	60
	WBL	10	10	10
	SBR	5	5	5
	SBL	5	5	5
	SBT	1605	1555	1605
	NBL	190	190	190
	NBT	985	985	985
	NBR	0	0	15
	All	**3105**	**3055**	**3120**
MD 390 at Purple Line Station Acc.	NBT	1125	1125	1140
	NBR	50	100	50
	SBT	1775	1775	1775
	SBL	50	0	50
	WBR	50	50	50
	WBL	50	50	50
	All	**3100**	**3100**	**3115**
MD 390 at Spring Ave	NBT	1105	1105	1120
	NBR	345	345	330
	WBR	70	120	70
	WBL	355	355	355
	SBT	1690	1690	1690
	SBL	135	135	135
	All	**3700**	**3750**	**3700**
MD 390 at MD 410	NBT	965	965	965
	NBR	20	20	20
	NBL	230	230	230
	WBR	235	235	235
	WBL	35	35	35
	WBT	915	915	915
	SBT	1405	1405	1405
	SBL	240	240	240
	SBR	400	400	400
	EBL	250	250	250
	EBR	135	135	135
	EBT	470	470	470
	ALL	**5300**	**5300**	**5300**

Attachment 2C: Intersection VISSIM LOS/Delays - PM Peak

No Build

Intersection	Mvmt.	Avg. Queue (ft)	Max. Queue (ft)	Vehs (All)	Veh% of Input Volume	Avg. Veh. Delay (All)
MD 390 at MD 97	SBR	307	924	1212	96%	27.2
	SBT	307	924	1346	98%	56.0
	EBR	349	994	4	80%	67.6
	EBL	349	994	1431	94%	81.2
	NBT	263	799	1578	99%	61.4
	All			5570	97%	57.7
MD 390 at 2nd Ave	EBL	98	397	10	100%	62.9
	EBT	98	397	95	106%	58.9
	EBR	98	397	133	99%	62.2
	WBR	18	125	11	110%	46.0
	WBT	18	125	56	102%	40.8
	WBL	18	125	4	80%	36.9
	SBR	74	460	7	140%	24.8
	SBL	74	460	4	80%	43.1
	SBT	74	460	1204	96%	24.6
	NBL	152	672	292	102%	64.6
	NBT	51	544	1476	97%	14.8
	NBR	51	544	0	#DIV/0!	0.0
	All			3292	98%	26.8
MD 390 at Purple Line Station Acc.	NBT	38	283	1741	99%	8.4
	NBR	38	283	55	110%	3.1
	SBT	32	422	1294	97%	3.6
	SBL	32	422	48	96%	90.4
	WBR	25	109	50	100%	39.7
	WBL	25	109	50	100%	40.5
	All			3237	98%	8.6
MD 390 at Spring Ave	NBT	40	661	1576	100%	12.0
	NBR	17	526	511	100%	11.6
	WBR	0	56	221	96%	2.9
	WBL	40	261	286	102%	41.2
	SBT	24	313	1219	96%	6.5
	SBL	24	313	126	101%	16.9
	All			3939	99%	12.0
MD 390 at MD 410	NBT	163	576	1375	100%	41.0
	NBR	163	576	49	109%	43.2
	NBL	163	576	135	100%	41.5
	WBR	177	655	338	99%	29.8
	WBL	177	655	19	95%	59.5
	WBT	177	655	660	100%	67.1
	SBT	169	596	1019	98%	40.6
	SBL	169	596	175	85%	57.6
	SBR	22	360	308	104%	10.8
	EBL	143	799	365	101%	47.5
	EBR	58	249	184	99%	18.9
	EBT	143	799	997	100%	27.2
	ALL			5624	99%	39.6

Build Option 1

Intersection	Mvmt.	Avg. Queue (ft)	Max. Queue (ft)	Vehs (All)	Veh% of Input Volume	Avg. Veh. Delay (All)
MD 390 at MD 97	SBR	273	894	1235	98%	25.4
	SBT	273	894	1377	100%	49.7
	EBR	517	1258	4	80%	62.0
	EBL	517	1258	1449	95%	77.5
	NBT	262	760	1585	99%	59.7
	All			5649	98%	54.3
MD 390 at 2nd Ave	EBL	125	441	10	100%	76.9
	EBT	125	441	89	99%	77.3
	EBR	125	441	138	102%	75.9
	WBR	18	144	11	110%	49.0
	WBT	18	144	55	100%	42.4
	WBL	18	144	5	100%	31.1
	SBR	72	422	4	80%	25.6
	SBL	72	422	4	80%	57.3
	SBT	72	422	1231	98%	23.9
	NBL	245	1551	263	92%	77.3
	NBT	123	1269	1452	96%	24.6
	NBR	123	1269	0	#DIV/0!	0.0
	All			3261	97%	32.7
MD 390 at Purple Line Station Acc.	NBT	165	749	1683	96%	22.9
	NBR	165	749	50	100%	26.0
	SBT	37	423	1319	98%	4.3
	SBL	37	423	52	104%	93.3
	WBR	26	109	49	98%	41.1
	WBL	26	109	50	100%	42.6
	All			3202	97%	17.0
MD 390 at Spring Ave	NBT	284	774	1522	97%	39.8
	NBR	169	763	495	97%	35.7
	WBR	266	680	215	93%	143.4
	WBL	266	680	277	99%	90.1
	SBT	60	478	1246	98%	17.5
	SBL	60	478	122	98%	40.2
	All			3876	97%	41.3
MD 390 at MD 410	NBT	277	943	1345	97%	69.7
	NBR	277	943	47	104%	63.4
	NBL	277	943	143	106%	62.6
	WBR	715	1227	316	93%	133.4
	WBL	715	1227	19	95%	184.2
	WBT	715	1227	606	92%	219.3
	SBT	264	773	1006	96%	54.2
	SBL	264	773	183	89%	78.4
	SBR	54	537	321	109%	18.0
	EBL	219	1008	359	100%	67.5
	EBR	60	249	186	101%	24.8
	EBT	219	1008	988	99%	32.7
	ALL			5518	97%	75.5

Build Option 1A

Intersection	Mvmt.	Avg. Queue (ft)	Max. Queue (ft)	Vehs (All)	Veh% of Input Volume	Avg. Veh. Delay (All)
MD 390 at MD 97	SBR	294	914	1176	97%	25.0
	SBT	294	914	1410	99%	52.5
	EBR	524	1320	4	80%	82.2
	EBL	524	1320	1441	94%	76.5
	NBT	249	842	1578	99%	57.2
	All			5610	97%	54.3
MD 390 at 2nd Ave	EBL	136	503	10	100%	81.8
	EBT	136	503	89	99%	82.3
	EBR	136	503	140	104%	81.7
	WBR	19	140	11	110%	46.1
	WBT	19	140	55	100%	43.3
	WBL	19	140	5	100%	32.8
	SBR	69	415	4	80%	18.6
	SBL	69	415	4	80%	33.6
	SBT	69	415	1172	98%	24.0
	NBL	142.9	1145	266	93%	60.0
	NBT	62.19	944	1455	96%	16.4
	NBR	62.19	944	0	#DIV/0!	0.0
	All			3210	97%	28.3
MD 390 at Purple Line Station Acc.	NBT	107	562	1687	96%	15.2
	NBR	107	562	105	105%	17.8
	SBT	2	174	1318	98%	1.7
	SBL	#N/A	#N/A	#N/A	#N/A	#N/A
	WBR	26	109	49	98%	41.1
	WBL	26	109	50	100%	42.6
	All			3209	98%	10.6
MD 390 at Spring Ave	NBT	218	776	1557	99%	30.1
	NBR	117	689	506	99%	27.6
	WBR	665	980	233	83%	335.3
	WBL	665	980	240	86%	286.3
	SBT	53	389	1244	98%	13.2
	SBL	53	389	123	98%	34.8
	All			3903	97%	58.0
MD 390 at MD 410	NBT	226	651	1370	99%	57.2
	NBR	226	651	47	104%	55.7
	NBL	226	651	146	108%	55.0
	WBR	625	1119	331	97%	111.1
	WBL	625	1119	20	100%	161.6
	WBT	625	1119	634	96%	187.1
	SBT	218	663	987	94%	51.5
	SBL	218	663	183	89%	75.2
	SBR	48	503	302	102%	18.3
	EBL	219	984	363	101%	66.8
	EBR	60	255	184	99%	23.5
	EBT	219	984	982	99%	33.3
	ALL			5548	98%	68.0

Build Option 2

Intersection	Mvmt.	Avg. Queue (ft)	Max. Queue (ft)	Vehs (All)	Veh% of Input Volume	Avg. Veh. Delay (All)
MD 390 at MD 97	SBR	370	952	1226	97%	30.0
	SBT	370	952	1361	99%	64.4
	EBR	630	1311	4	80%	82.4
	EBL	630	1311	1462	96%	89.4
	NBT	327	1037	1560	98%	72.5
	All			5613	97%	65.7
MD 390 at 2nd Ave	EBL	148	499	10	100%	93.0
	EBT	148	499	88	98%	87.8
	EBR	148	499	138	102%	87.9
	WBR	19	140	11	110%	46.4
	WBT	19	140	55	100%	43.7
	WBL	19	140	4	80%	29.7
	SBR	80	471	4	80%	28.1
	SBL	80	471	4	80%	80.4
	SBT	80	471	1218	97%	26.4
	NBL	262	1336	270	95%	69.7
	NBT	207	1254	1479	98%	30.5
	NBR	207	1254	0	#DIV/0!	0.0
	All			3280	97%	36.7
MD 390 at Purple Line Station Acc.	NBT	65	491	1731	99%	10.0
	NBR	65	491	51	102%	14.0
	SBT	8	276	1308	98%	2.6
	SBL	8	276	52	104%	24.7
	WBR	24	109	49	98%	39.1
	WBL	24	109	50	100%	40.1
	All			3241	99%	8.2
MD 390 at Spring Ave	NBT	170	726	1563	100%	24.1
	NBR	73	645	510	100%	20.7
	WBR	207	513	223	97%	119.3
	WBL	207	513	287	103%	63.5
	SBT	45	370	1232	97%	11.3
	SBL	45	370	122	98%	32.4
	All			3937	99%	28.1
MD 390 at MD 410	NBT	173	574	1366	99%	45.2
	NBR	173	574	47	104%	40.8
	NBL	173	574	146	108%	45.6
	WBR	432	1036	345	101%	70.3
	WBL	432	1036	21	105%	114.1
	WBT	432	1036	662	100%	134.6
	SBT	206	742	1001	96%	48.2
	SBL	206	742	181	88%	70.3
	SBR	45	451	322	109%	16.3
	EBL	149	787	367	102%	50.7
	EBR	59	252	186	101%	19.0
	EBT	149	787	992	100%	27.3
	ALL			5637	100%	53.6

Build Option 2A

Intersection	Mvmt.	Avg. Queue (ft)	Max. Queue (ft)	Vehs (All)	Veh% of Input Volume	Avg. Veh. Delay (All)
MD 390 at MD 97	SBR	302	939	1183	98%	25.6
	SBT	302	939	1420	100%	52.4
	EBR	447	1216	4	80%	58.7
	EBL	447	1216	1435	94%	69.9
	NBT	279	891	1576	99%	63.2
	All			5618	97%	54.3
MD 390 at 2nd Ave	EBL	133	479	10	100%	83.0
	EBT	133	479	89	99%	79.2
	EBR	133	479	139	103%	80.5
	WBR	19	145	11	110%	45.9
	WBT	19	145	55	100%	44.1
	WBL	19	145	5	100%	37.5
	SBR	68	426	4	80%	23.9
	SBL	68	426	4	80%	54.7
	SBT	68	426	1174	98%	23.4
	NBL	152	1068	262	92%	58.5
	NBT	63	809	1439	95%	15.1
	NBR	63	809	0	#DIV/0!	0.0
	All			3192	96%	27.3
MD 390 at Purple Line Station Acc.	NBT	52	449	1661	95%	8.1
	NBR	52	449	104	104%	12.8
	SBT	2	159	1316	98%	1.9
	SBL	#N/A	#N/A	#N/A	#N/A	#N/A
	WBR	26	109	49	98%	41.1
	WBL	26	109	50	100%	42.6
	All			3180	97%	6.8
MD 390 at Spring Ave	NBT	212	724	1540	98%	29.5
	NBR	123	661	502	98%	28.2
	WBR	667	942	230	82%	334.0
	WBL	667	942	231	83%	285.7
	SBT	64	445	1231	97%	17.0
	SBL	64	445	121	97%	35.8
	All			3854	96%	58.5
MD 390 at MD 410	NBT	233	784	1354	98%	59.0
	NBR	233	784	47	104%	55.8
	NBL	233	784	145	107%	54.3
	WBR	520	1200	323	95%	94.3
	WBL	520	1200	20	100%	145.8
	WBT	520	1200	619	94%	172.3
	SBT	217	636	984	94%	50.8
	SBL	217	636	180	88%	67.7
	SBR	44	441	295	100%	17.0
	EBL	280	1282	362	101%	76.2
	EBR	62	253	186	101%	29.5
	EBT	280	1282	991	100%	37.6
	ALL			5505	97%	65.6

Build Option 3

Intersection	Mvmt.	Avg. Queue (ft)	Max. Queue (ft)	Vehs (All)	Veh% of Input Volume	Avg. Veh. Delay (All)
MD 390 at MD 97	SBR	328	941	1224	97%	28.2
	SBT	328	941	1360	99%	57.4
	EBR	616	1276	0	#DIV/0!	0.0
	EBL	616	1276	1448	95%	88.2
	NBT	290	881	1574	99%	65.5
	All			5606	97%	61.2
MD 390 at 2nd Ave	EBL	160	499	10	100%	103.5
	EBT	160	499	86	96%	92.9
	EBR	160	499	135	100%	95.3
	WBR	24	148	11	110%	63.3
	WBT	24	148	55	100%	52.3
	WBL	24	148	5	100%	59.2
	SBR	77	443	4	80%	16.4
	SBL	77	443	4	80%	52.5
	SBT	77	443	1218	97%	25.2
	NBL	308	1598	260	91%	79.8
	NBT	269	1515	1456	96%	37.5
	NBR	269	1515	40	100%	32.1
	All			3283	97%	40.5
MD 390 at Purple Line Station Acc.	NBT	102	580	1746	98%	15.1
	NBR	102	580	51	102%	16.9
	SBT	33	330	1306	97%	3.5
	SBL	33	330	51	102%	88.8
	WBR	25	109	48	96%	39.5
	WBL	25	109	49	98%	40.8
	All			3252	98%	12.4
MD 390 at Spring Ave	NBT	230	775	1578	98%	32.0
	NBR	123	738	470	99%	29.3
	WBR	209	577	219	95%	114.8
	WBL	209	577	281	100%	63.0
	SBT	48	340	1230	97%	12.8
	SBL	48	340	122	98%	33.3
	All			3901	98%	32.5
MD 390 at MD 410	NBT	289	871	1360	99%	69.9
	NBR	289	871	47	104%	61.0
	NBL	289	871	145	107%	74.8
	WBR	621	1142	328	96%	107.7
	WBL	621	1142	20	100%	170.8
	WBT	621	1142	622	94%	196.4
	SBT	232	657	996	95%	50.1
	SBL	232	657	180	88%	77.7
	SBR	42	489	320	108%	13.5
	EBL	310	1072	363	101%	76.0
	EBR	61	254	186	101%	33.5
	EBT	310	1072	991	100%	43.0
	ALL			5558	98%	73.9

Input Volumes

Intersection	Mvmt.	NoBuild, Opt 1, Opt 2	Opt 1A, Opt 2A	Opt 3
MD 390 at MD 97	SBR	1260	1210	1260
	SBT	**1375**	**1425**	**1375**
	EBR	5	5	0
	EBL	1530	1530	1530
	NBT	**1595**	**1595**	**1595**
	All	5765	5765	5760
MD 390 at 2nd Ave	EBL	10	10	10
	EBT	90	90	90
	EBR	135	135	135
	WBR	10	10	10
	WBT	55	55	55
	WBL	5	5	5
	SBR	5	5	5
	SBL	5	5	5
	SBT	1250	1200	1250
	NBL	285	285	285
	NBT	1515	1515	1510
	NBR	0	0	40
	All	3365	3315	3400
MD 390 at Purple Line Station Acc.	NBT	1750	1750	1785
	NBR	50	100	50
	SBT	1340	1340	1340
	SBL	50	0	50
	WBR	50	50	50
	WBL	50	50	50
	All	3290	3290	3325
MD 390 at Spring Ave	NBT	1570	1570	1605
	NBR	510	510	475
	WBR	230	280	230
	WBL	280	280	280
	SBT	1265	1265	1265
	SBL	125	125	125
	All	3980	4030	3980
MD 390 at MD 410	NBT	1380	1380	1380
	NBR	45	45	45
	NBL	135	135	135
	WBR	340	340	340
	WBL	20	20	20
	WBT	660	660	660
	SBT	1045	1045	1045
	SBL	205	205	205
	SBR	295	295	295
	EBL	360	360	360
	EBR	185	185	185
	EBT	995	995	995
	ALL	5665	5665	5665