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To:	Chuck Edwards, PE NCDOT Division 7, District 1	From:	Jeff Weller, PE
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**Reference: SR 1010 (East Main Street) Operational Analysis – Carrboro, NC**

The Town of Carrboro is investigating the potential for operational changes along SR 1010 (East Main Street) from the intersection of Weaver Street/Roberson Street to the intersection of Rosemary Street. With other planned or potential changes in the area, including bicycle and pedestrian improvements to the nearby intersection of East Main Street with West Franklin Street, Merritt Mill Road, and Brewer Lane, and the completion of the 300 East Main Street redevelopment, as well as updating the Town's bicycle connectivity plan, Stantec was asked to prepare a study documenting the effects of incorporating a reduced cross-section for this portion of East Main Street.

**Volume Development**

The Durham-Chapel Hill-Carrboro (DCHC) Metropolitan Planning Organization (MPO) provided Stantec with intersection turning movement counts collected in the fall of 2017. Stantec used these counts to develop seasonally-adjusted 24-hour annual average daily traffic (AADT) volumes for each roadway segment in the study area. Following this, the North Carolina Department of Transportation (NCDOT) Traffic Forecast Utility (TFU) was used to develop balanced daily turning volumes for each intersection that closely replicate the raw turning movement volumes for each associated intersection. The settings in the TFU are maintained in future year volume development.

Stantec investigated short-term (10 year) and long-term (20 year) growth trends of the corridor by analyzing historical volume data provided by NCDOT Traffic Survey Group (TSG). Based on the historical data, the locations with available volumes all experienced negative growth for both the short-term and long-term analyses. While these growth trends are useful background information, historical growth is not necessarily an indicator of future growth.

DCHC MPO also provided output from the Triangle Regional Model (TRM) to assist in the development of growth rates for the area. The calculated compound aggregate growth rate (CAGR) for the sections of East Main Street included in this study area ranged from 0.57% - 0.98% per year. It was determined that a CAGR of 0.75% would be adequate for this study. The link volumes were then grown to 2030, which was the agreed-upon future analysis year at the onset of this study. These grown volumes were then incorporated into the TFU to develop daily turning volumes for the future year analyses.

A copy of the East Main Street Operational Analysis (EMSOA) Volume Development Memo is included in the appendix.

**SR 1010 (East Main Street) Operational Analysis – Carrboro, NC****Operational Analysis**

The existing cross-section consists of a four-lane undivided pattern. Four-lane undivided highways typically experience relatively high crash frequencies, especially as traffic volumes and turning movements increase over time, resulting in conflicts between high-speed through traffic, left-turning vehicles, and other road users. A reduction in travel lanes usually results in a corresponding reduction of crashes along the magnitude of 19-47%, a reduction in vehicle speed differential, improvement in the mobility and access by all road users, and integration of the roadway into surrounding uses that results in an enhanced quality of life. A key feature of a lane reduction is that it allows reclaimed space to be allocated for other uses, such as turn lanes, bus lanes, pedestrian refuge islands, bike lanes, sidewalks, bus shelters, parking, or landscaping.

**Traffic Safety**

A crash analysis was performed for the study area section of East Main Street between East Weaver Street/Roberson Street and West Rosemary Street using NCDOT's Traffic Engineering Accident Analysis System (TEAAS). The study period was from February 1<sup>st</sup>, 2014 to January 31<sup>st</sup>, 2019.

There were 52 total crashes within this time period with no fatalities and 13 crashes involving Class B or C injuries. The total crash rate for this section is 988.80 crashes per 100 million vehicle miles. According to NCDOT, the 2015-2017 NCDOT total crash rate for a secondary road in an urban setting is 315.24 so the crash rate of East Main Street is more than three times the state average. The severity index for East Main Street (2.85) is less than the state average of 3.96 for urban secondary roads, likely due to the lower speed limit along this stretch (20 mph). Most crashes happened in the vicinity of the East Main Street & Lloyd Street intersection (60% of crashes).

It is estimated from looking at the crash reports that 20 out of the 52 total crashes (38%) could potentially have been prevented or less severe with a change in the cross-section on East Main Street. Reducing East Main Street to one thru lane per direction would prevent same direction sideswipes from occurring. A dedicated center left-turn lane instead of a shared thru-left turn lane would allow vehicles to safely make left turns without fear of being rear-ended by a distracted driver and only having to cross one opposing travel lane instead of two. Lastly, about 10% of the crashes involved pedestrians and reducing the number of lanes from 4 to 3 would reduce the risk of being struck by a vehicle when crossing East Main Street on foot.

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A summary of the crashes by type is as follows:

<b>Accident Type</b>	<b>Number Of Crashes</b>	<b>Percent Of Total</b>
Rear End, Slow Or Stop	14	26.92
Sideswipe, Same Direction	11	21.15
Angle	5	9.62
Pedestrian	5	9.62
Fixed Object	4	7.69
Left Turn, Same Roadway	4	7.69
Left Turn, Different Roadways	3	5.77
Backing Up	2	3.85
Animal	1	1.92
Head On	1	1.92
Ran Off Road - Right	1	1.92
Right Turn, Different Roadways	1	1.92

**Synchro Analysis**

Stantec conducted peak hour traffic analyses for the study area. Based on projected volumes, the analyzed cross-section for the build scenarios consists of a three-lane section, including a center two-way left-turn lane (TWLTL).

The following signalized intersections were included in this analysis (shown in Figure 1, attached to this memo):

- SR 1010 (East Main Street/West Franklin Street) & SR 1771/1927 (Merritt Mill Road)/Brewer Lane
- SR 1010 (East Main Street) & West Rosemary Street
- SR 1010 (East Main Street) & Lloyd Street
- SR 1010 (East Main Street) & East Weaver Street/Roberson Street
- SR 1010 (Main Street) & SR 1772/1919 (Greensboro Street)
- SR 1772 (North Greensboro Street) & Weaver Street

The analysis performed on these alternatives involved modeling the scenarios in Synchro 10 and gathering outputs such as delay, level of service (LOS), and queuing. The analysis is detailed below.

### **SR 1010 (East Main Street) Operational Analysis – Carrboro, NC**

The following scenarios were modeled in Synchro 10 and simulated in SimTraffic to see the potential effects on traffic flow along East Main Street with and without the proposed lane reduction utilizing normalized traffic volumes from 2017 and projected future year traffic volumes in 2030.

- 2017 Existing Conditions
- 2017 Build Scenario
  - Option 1: Existing North Greensboro Street & Weaver Street Intersection
  - Option 2: Eliminate southbound left at North Greensboro Street & Weaver Street Intersection
- 2030 No Build Scenario
- 2030 Build Scenario
  - Option 1: Existing North Greensboro Street & Weaver Street Intersection
  - Option 2: Eliminate southbound left at North Greensboro Street & Weaver Street Intersection

The current NCDOT *Congestion Management Capacity Analysis Guidelines* were used for this project.

The following assumptions were made in the Synchro models:

- In the traffic counts used to develop the 2017 and 2030 peak hour volumes, there were vehicles entering and exiting the Wings Over Chapel Hill parking lot at the E Main Street and Rosemary Street signal from all three legs of the intersection. To account for these vehicles entering and exiting the parking lot, this leg was added to the signal in the Synchro models despite the fact that it is not currently part of the signal.
- Currently, there is a southbound left turn lane at the East Main Street & Lloyd Street intersection. Based on coordination with NCDOT, Town of Carrboro, and to provide better access into and out of the Lloyd Street approach, the exclusive left-turn lane is assumed to be removed.
- Due to driveways along East Main Street between the East Main Street & Lloyd Street and East Main Street & West Rosemary Street intersections, a volume imbalance was noted with the normalized traffic volumes. A dummy driveway was inserted into the model at this location to account for this difference. This driveway also represents a driveway for the 300 East Main Street redevelopment.

Figures summarizing the volumes, geometry, and level of service/delay from the Synchro models are included in the appendix.

## SR 1010 (East Main Street) Operational Analysis – Carrboro, NC

### 2017 Existing Conditions

2017 Existing		LOS and Delay (seconds / vehicle)						
		Overall	EB	WB	NB	SB	NEB	SEB
East Main Street/West Franklin Street & Merritt Mill Road/Brewer Lane	AM	C (28.5)	A (6.7)	B (11.8)	E (55.1)	D (42.2)	F (128.4)	-
	PM	D (37.0)	A (6.7)	B (19.1)	E (56.4)	D (38.5)	F (148.7)	-
East Main Street & West Rosemary Street	AM	C (24.7)	B (18.9)	A (6.4)	D (50.3)	C (33.8)	-	-
	PM	C (28.2)	C (29.7)	B (10.1)	D (38.5)	C (27.7)	-	-
East Main Street & Lloyd Street	AM	B (12.0)	A (7.2)	A (3.8)	D (44.8)	E (57.6)	-	-
	PM	A (8.6)	A (4.4)	A (2.8)	D (53.1)	E (57.8)	-	-
East Main Street & East Weaver Street/Roberson Street	AM	C (27.3)	B (14.6)	B (14.6)	D (42.0)	E (59.2)	-	D (47.5)
	PM	C (26.7)	B (10.2)	B (13.7)	D (51.3)	E (66.2)	-	E (55.8)
Main Street & Greensboro Street	AM	C (26.0)	C (32.5)	B (18.0)	C (29.8)	C (21.0)	-	-
	PM	C (25.3)	C (26.7)	B (10.5)	D (39.1)	B (18.0)	-	-
North Greensboro Street & Weaver Street	AM	C (29.4)	B (19.1)	B (14.0)	B (16.4)	D (47.4)	-	-
	PM	D (39.0)	B (18.3)	C (20.0)	C (22.9)	E (72.6)	-	-

In the 2017 Existing conditions, all of the study intersections operate at LOS D or better in both peak hours. Multiple minor street approaches to the signalized intersections operate at LOS E or F during the peak hour. This is not uncommon as the emphasis is generally to provide flow for the major thru movement, especially during the peak hours.

There is some queuing along Greensboro Street in the AM peak hour especially the southbound Greensboro Street approach at the North Greensboro Street & Weaver Street intersection. In addition, the Weaver Street approach at the East Main Street & East Weaver Street/Roberson Street intersection sometimes queues back towards the North Greensboro Street & Weaver Street intersection, reducing the number of southbound lefts that can be made from Greensboro Street to Weaver Street.

There is some queueing along Greensboro Street in the PM peak hour but these queues quickly dissipate as the signal cycles to the Greensboro Street phases.

It should be noted that throughout this study, the Brewer Lane approach at the East Main Street/West Franklin Street & Merritt Mill Road/Brewer Lane intersection operates at LOS F due to the fact that the approach is served every other signal cycle.

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**2017 Build Scenario**

2017 Build - Option 1		LOS and Delay (seconds / vehicle)						
		Overall	EB	WB	NB	SB	NEB	SEB
East Main Street/West Franklin Street & Merritt Mill Road/Brewer Lane	AM	C (24.2)	A (7.5)	A (9.3)	D (44.1)	C (32.9)	F (116.6)	-
	PM	C (29.3)	A (7.3)	B (17.4)	D (45.9)	C (29.2)	F (101.1)	-
East Main Street & West Rosemary Street	AM	C (20.2)	B (12.9)	B (14.7)	D (40.4)	B (16.0)	-	-
	PM	C (24.9)	B (19.4)	C (22.9)	C (34.1)	B (11.2)	-	-
East Main Street & Lloyd Street	AM	B (12.2)	B (11.2)	A (4.3)	C (30.7)	D (40.9)	-	-
	PM	A (8.2)	A (4.9)	A (5.0)	D (35.4)	D (40.6)	-	-
East Main Street & East Weaver Street/Roberson Street	AM	C (28.8)	C (28.9)	C (23.9)	C (32.4)	D (48.2)	-	C (28.2)
	PM	C (25.7)	B (19.8)	C (21.4)	D (38.5)	D (43.6)	-	C (31.6)
Main Street & Greensboro Street	AM	C (20.4)	B (18.0)	A (6.3)	C (33.1)	C (20.7)	-	-
	PM	C (20.2)	B (18.4)	A (5.5)	C (34.3)	B (16.6)	-	-
North Greensboro Street & Weaver Street	AM	C (21.1)	C (25.5)	A (5.8)	C (25.7)	C (23.2)	-	-
	PM	C (22.1)	C (25.7)	B (13.1)	C (25.7)	C (23.1)	-	-

2017 Build - Option 2		LOS and Delay (seconds / vehicle)						
		Overall	EB	WB	NB	SB	NEB	SEB
East Main Street/West Franklin Street & Merritt Mill Road/Brewer Lane	AM	C (24.1)	A (7.4)	A (9.3)	D (44.1)	C (32.9)	F (116.6)	-
	PM	C (29.0)	A (7.5)	B (17.9)	D (43.9)	C (28.7)	F (101.1)	-
East Main Street & West Rosemary Street	AM	B (19.2)	B (11.0)	B (14.7)	D (40.4)	B (16.0)	-	-
	PM	C (25.2)	B (20.0)	C (22.9)	C (34.2)	B (11.2)	-	-
East Main Street & Lloyd Street	AM	B (10.6)	A (7.7)	A (4.7)	C (30.7)	D (40.9)	-	-
	PM	A (7.6)	A (4.6)	A (4.0)	D (35.4)	D (40.6)	-	-
East Main Street & East Weaver Street/Roberson Street	AM	C (23.5)	C (25.2)	B (16.2)	C (32.2)	D (45.9)	-	C (22.5)
	PM	C (22.2)	C (22.6)	B (16.2)	D (38.4)	D (43.4)	-	C (26.1)
Main Street & Greensboro Street	AM	C (23.7)	C (27.4)	B (11.1)	D (44.5)	B (12.7)	-	-
	PM	C (22.8)	C (30.0)	B (13.8)	D (35.7)	B (10.1)	-	-
North Greensboro Street & Weaver Street	AM	B (17.5)	C (23.6)	B (11.0)	A (5.7)	C (24.9)	-	-
	PM	B (16.7)	B (18.1)	A (5.6)	A (9.8)	C (29.2)	-	-

**SR 1010 (East Main Street) Operational Analysis – Carrboro, NC**

Two Build scenarios were studied in this analysis. Option 1 retains the existing North Greensboro Street & Weaver Street configuration while Option 2 eliminates the southbound left at the North Greensboro Street & Weaver Street intersection. Vehicles making this movement would be redirected to the Main Street & Greensboro Street intersection. This was done with the thought of being able to shorten the length of the Weaver Street approach phase at the East Main Street & East Weaver Street/Roberson Street intersection to give the East Main Street phases more time.

Despite the fact that this intersection operates at an overall acceptable level of service, it was noted while observing the SimTraffic simulation runs that there was excessive queuing caused by left-turning traffic not being able to find a gap in the opposing traffic and exacerbated by the reduced laneage on East Main Street. In addition to the lane reduction in the Build scenarios along East Main Street, and as was discussed in a coordination meeting with the Town of Carrboro and NCDOT, the left turns from East Main Street at the East Weaver Street/Roberson Street intersection were eliminated to simulate a restricted movement during peak hours. In the Build scenario models, the eastbound left from East Main Street to Weaver Street and Carr Mill Driveway was diverted to Roberson Street via southbound Greensboro Street. The westbound left from East Main Street to Roberson Street was diverted to Greensboro Street via the westbound left movement at Main Street & Greensboro Street.

Overall, in the 2017 Build scenario, both options operate at an acceptable level of service with all movements operating at LOS D or better (with exception of the Brewer Lane approach). In Option 2, the intersection of Main Street & Greensboro Street degrades by a 3 second average in each peak compared to Option 1 due to the added traffic from the elimination of the North Greensboro Street & Weaver Street southbound lefts. The East Main Street & East Weaver Street/Roberson Street approach improves by a 4 second average in each peak compared to Option 1 as a result of this change.

In Option 1, there are no queuing issues of note in the AM peak hour. In the PM peak hour, there is queuing along westbound East Main Street, extending from the East Weaver Street/Roberson Street intersection, past the Lloyd Street intersection and occasionally to the West Rosemary Street intersection. It does not appear that this queue has a significant impact on the operations of the side street at these intersections.

In Option 2, there is definitely some observable queuing on the southbound Greensboro Street approach at the North Greensboro Street & Weaver Street intersection in the AM peak hour as a result of the elimination of the southbound left-turn movement. The 50' southbound left turn lane at the Main Street & Greensboro Street occasionally is insufficient for the additional left turns at this intersection but the spillback queue never appears to queue past the North Greensboro Street & Weaver Street intersection and the lagging protected left-turn phase for this movement clears out the left turns so the full 50' of storage is available for the next stream of southbound vehicles along Greensboro Street. In the PM peak hour, there is some queuing along westbound East Main Street similar to that in Option 1, though the queues appear to be less extreme due to the improved operations of the East Main Street & East Weaver Street/Roberson Street (the Synchro 95<sup>th</sup> percentile queue length for this approach is 193' in Option 2, as opposed to 244' in Option 1).

**SR 1010 (East Main Street) Operational Analysis – Carrboro, NC**

**2030 No Build Scenario**

2030 No Build		LOS and Delay (seconds / vehicle)						
		Overall	EB	WB	NB	SB	NEB	SEB
East Main Street/West Franklin Street & Merritt Mill Road/Brewer Lane	AM	C (30.1)	A (6.2)	B (14.4)	E (57.5)	D (43.1)	F (137.7)	-
	PM	D (38.1)	A (4.3)	B (19.9)	E (59.3)	D (39.8)	F (158.6)	-
East Main Street & West Rosemary Street	AM	C (27.0)	B (19.0)	A (6.6)	E (59.2)	D (36.9)	-	-
	PM	C (30.3)	C (31.3)	B (10.2)	D (43.0)	C (27.8)	-	-
East Main Street & Lloyd Street	AM	B (13.1)	A (7.9)	A (4.3)	D (49.0)	E (62.9)	-	-
	PM	A (9.7)	A (5.1)	A (4.1)	D (53.4)	E (57.8)	-	-
East Main Street & East Weaver Street/Roberson Street	AM	C (31.0)	B (13.7)	B (18.4)	D (45.2)	E (66.7)	-	D (54.1)
	PM	C (28.5)	B (10.5)	B (14.7)	D (51.4)	E (71.3)	-	E (60.6)
Main Street & Greensboro Street	AM	C (33.3)	D (38.1)	C (20.8)	C (34.3)	D (35.6)	-	-
	PM	C (27.5)	C (33.9)	B (14.5)	D (38.2)	B (18.2)	-	-
North Greensboro Street & Weaver Street	AM	C (31.3)	C (23.8)	B (15.8)	B (12.8)	D (51.2)	-	-
	PM	C (35.0)	C (20.6)	B (19.3)	B (16.1)	E (66.2)	-	-

In the 2030 No Build Scenario, all of the intersections operate at LOS D or better in both peak hours. Several minor street approaches operate at LOS E during peak hours but there are no queuing issues of note associated with these approaches.

In the AM peak hour, there are long queues along Greensboro Street in both the northbound and southbound directions. In addition, there is extremely length queuing on eastbound East Main Street approach at the East Main Street & East Weaver Street/Roberson Street. From the SimTraffic simulation, it appears that vehicles attempting to turn left from East Main Street to East Weaver Street or the Carr Mill Driveway are having trouble finding a gap in opposing westbound traffic and are impeding thru East Main Street traffic behind them since there is not a dedicated left-turn lane. There is some queuing on westbound East Main Street at this intersection as well as extending past the East Main Street & Lloyd Street intersection, though not to the extent as the eastbound East Main Street queues.

In the PM peak hour, there are no major queuing issues of note. Similar to the 2017 No Build scenario, there are some temporary queues that quickly dissipate as signals cycle from thru that has minimal impacts on overall operations.

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**2030 Build Scenario**

2030 Build - Option 1		LOS and Delay (seconds / vehicle)						
		Overall	EB	WB	NB	SB	NEB	SEB
East Main Street/West Franklin Street & Merritt Mill Road/Brewer Lane	AM	C (25.0)	A (6.7)	B (10.4)	D (45.0)	C (31.7)	F (130.2)	-
	PM	C (29.1)	A (9.5)	C (23.0)	D (39.3)	C (28.6)	F (90.1)	-
East Main Street & West Rosemary Street	AM	C (21.3)	B (13.7)	B (15.8)	D (42.2)	B (15.7)	-	-
	PM	C (27.0)	C (23.0)	C (26.1)	C (33.8)	B (10.5)	-	-
East Main Street & Lloyd Street	AM	B (11.4)	A (8.6)	A (4.9)	C (32.6)	D (44.1)	-	-
	PM	B (10.2)	A (6.4)	A (7.8)	D (35.4)	D (40.8)	-	-
East Main Street & East Weaver Street/Roberson Street	AM	C (34.2)	D (38.7)	C (26.1)	C (31.2)	D (48.1)	-	D (38.1)
	PM	C (29.7)	C (24.1)	C (25.5)	D (37.0)	D (44.1)	-	D (38.4)
Main Street & Greensboro Street	AM	C (24.3)	C (21.3)	A (7.4)	D (47.2)	B (17.6)	-	-
	PM	C (23.7)	C (22.7)	A (8.2)	D (40.3)	B (16.5)	-	-
North Greensboro Street & Weaver Street	AM	C (23.0)	C (28.3)	A (9.7)	C (27.0)	C (23.9)	-	-
	PM	C (26.7)	C (30.5)	B (13.0)	D (37.4)	C (24.1)	-	-

2030 Build - Option 2		LOS and Delay (seconds / vehicle)						
		Overall	EB	WB	NB	SB	NEB	SEB
East Main Street/West Franklin Street & Merritt Mill Road/Brewer Lane	AM	C (24.4)	A (6.5)	B (10.7)	D (44.5)	C (31.2)	F (121.0)	-
	PM	C (29.4)	A (6.8)	B (19.9)	D (42.2)	C (29.0)	F (106.3)	-
East Main Street & West Rosemary Street	AM	C (21.5)	B (13.9)	B (15.8)	D (42.5)	B (15.7)	-	-
	PM	C (27.7)	C (24.8)	C (26.1)	C (33.6)	B (10.5)	-	-
East Main Street & Lloyd Street	AM	B (11.6)	A (8.9)	A (4.9)	C (32.6)	D (44.1)	-	-
	PM	B (10.0)	A (5.8)	A (7.9)	D (35.4)	D (40.7)	-	-
East Main Street & East Weaver Street/Roberson Street	AM	C (25.1)	C (27.0)	B (17.5)	C (31.7)	D (48.3)	-	C (24.0)
	PM	C (23.2)	C (23.3)	B (17.5)	D (37.4)	D (44.3)	-	C (27.4)
Main Street & Greensboro Street	AM	C (29.9)	C (31.0)	B (19.7)	D (52.5)	B (18.5)	-	-
	PM	C (25.7)	C (34.5)	B (16.3)	D (38.0)	B (12.9)	-	-
North Greensboro Street & Weaver Street	AM	B (18.8)	C (27.1)	B (14.1)	A (6.3)	C (24.9)	-	-
	PM	B (17.5)	C (20.1)	A (7.2)	A (9.3)	C (30.1)	-	-

**SR 1010 (East Main Street) Operational Analysis – Carrboro, NC**

Overall, in the 2030 Build scenario, both options operate at an acceptable level of service with all movements operating at LOS D or better. In Option 2, the intersection of Main Street & Greensboro Street degrades by a 4 second average in each peak compared to Option 1 due to the added traffic from the elimination of the North Greensboro Street & Weaver Street southbound lefts. The East Main Street & East Weaver Street/Roberson Street approach improves by an 8 second average in each peak compared to Option 1 as a result of this change.

In Option 1, there is some occasional queuing along Greensboro Street in both directions. Also, there is some queuing along westbound East Main Street between Weaver Street/Roberson Street and Rosemary Street, but these queues are occasional and do not last the entire peak hour. In the PM peak hour, there is queuing along westbound East Main Street, extending from the East Weaver Street/Roberson Street intersection, past the Lloyd Street intersection and the West Rosemary Street intersection. There is some queuing on the Lloyd Street approaches as a result of this queuing. Also, the queues on eastbound Weaver Street extend towards Greensboro Street during the PM peak hour.

In Option 2, there is definitely some observable queuing on the southbound Greensboro Street approach at the North Greensboro Street & Weaver Street intersection in the AM peak hour as a result of the elimination of the southbound left-turn movement. The 50' southbound left turn lane at the Main Street & Greensboro Street occasionally is insufficient for the additional left turns at this intersection but the spillback queue never appears to queue past the North Greensboro Street & Weaver Street intersection and the lagging protected left-turn phase for this movement clears out the left turns so the full 50' of storage is available for the next stream of southbound vehicles along Greensboro Street. There is also occasional queues that build up along northbound Greensboro Street and eastbound/westbound East Main Street between Weaver Street/Roberson Street and Rosemary Street as a result of the lane reduction. In the PM peak hour, there is some queuing along westbound East Main Street similar to that in Option 1, though the queues appear to be less extreme due to the improved operations of the East Main Street & East Weaver Street/Roberson Street (the Synchro 95<sup>th</sup> percentile queue length for this approach is 246' in Option 2, as opposed to 283' in Option 1). There is also some observed queuing along Greensboro Street.

## SR 1010 (East Main Street) Operational Analysis – Carrboro, NC

### Observations/Notes

- There is a sense from field observations that the potential traffic flow currently at the study intersections may be worse than the Synchro analysis shows in the 2017 Existing Conditions. As part of the Synchro analysis, signal phasing and splits are optimized to provide the best operations throughout the network. It is possible that the current signal timings on East Main Street are not operating at the optimal timings as Synchro shows. It is also possible that pedestrians are preventing turning movements from being made as optimally as Synchro is showing (which is typically not a factor in the NCDOT Congestion Management analyses using Synchro). Whichever reason is contributing to this difference, the difference in average delay between the 2030 Build Scenario and the 2017 Existing Conditions at the study intersections is fairly minimal. Based on results and engineering judgment, there is a high level of confidence that a reduction in thru lanes would still provide adequate operations, even if East Main Street signal operations were significantly worse than what was shown in Synchro.
- In the SimTraffic simulation runs, it was occasionally observed that there was some queuing on westbound East Main Street from the East Main Street & East Weaver Street/Roberson Street intersection that extends into past the East Main Street & Lloyd Street intersection due to the close proximity of the intersections. This queuing is temporary though and clears out quickly. This queuing also does not appear to affect the side street approaches at the East Main Street & Lloyd Street intersection. There was also some noticeable queuing on Greensboro Street in both directions during both peak hours though this did not significantly change between the different scenarios.
- It should be noted that the results of the East Main Street/West Franklin Street & Merritt Mill Road/Brewer Lane intersection differ slightly from the traffic analysis for the NCDOT (formerly U-5847) project also completed by Stantec in May 2016, especially for the PM peak hour. While the intersection in this analysis operates at LOS D in the PM peak hour for the base year of 2017, the U-5847 indicated that this intersection operates at LOS E in the PM peak hour for the base year of 2016. The 2017 volumes at the intersection in this analysis are slightly lower than the 2016 volumes for U-5847. This is not unexpected with negative growth being realized in this area, as mentioned in the Volume Development section. One change that was included in our models for this analysis is a proposed change to the signal timing at this intersection that will run the Brewer Lane approach phase every other cycle, thus also improving operations along East Main Street/West Franklin Street.
- The town of Chapel Hill is considering a lane reduction along West Franklin Street east of this project. Using Hillsborough Street in Raleigh as a study case, it was found that after the lane reduction along that corridor, the AADT along Hillsborough Street was reduced by 25%. When studying the effects of this 25% reduction from inbound/outbound West Franklin Street traffic, it was found that intersections within the study area improved by an average of 1 second between both peak hours. With the reduced traffic volumes, it becomes possible to put the westbound left at East Main Street & Weaver Street/Roberson Street back into the Build scenario. However, operations still remain better without this movement. Additionally, a lane reduction on Franklin Street would eliminate the need for the westbound lane drop between Merritt Mill and Rosemary.

## **SR 1010 (East Main Street) Operational Analysis – Carrboro, NC**

### **Summary**

Overall, all of the study intersections in the vicinity of the proposed East Main Street reduced cross-section operate at LOS D or better in all of the 2017 and 2030 No Build/Build scenarios. There is very little difference in average overall delay and average approach delays between the No Build & Build scenarios in both 2017 and 2030.

The crash history along this corridor seems to indicate that about 1/3<sup>rd</sup> of crashes in recent years could be prevented, or less severe, with the implementation of a lane reduction on East Main Street. Given the crash rate along East Main Street from West Rosemary Street and East Weaver Street/Roberson Street, it is likely that a lane reduction would improve safety along this corridor.

Given the minimal changes in traffic operations and the potential of reduced crashes, a lane reduction on East Main Street should be able to be implemented without major impacts to the roadway network.

### **STANTEC CONSULTING SERVICES INC.**

Jeff Weller, PE  
Transportation Engineer  
Phone: (919)-865-7564  
Jeff.Weller@Stantec.com

Attachment: Figures  
Synchro Files  
Synchro/SimTraffic PDF Outputs  
Existing Signal Plans  
Volumes Breakouts & Data  
EMSOA Volume Development Memo

Figure 1: Vicinity Map

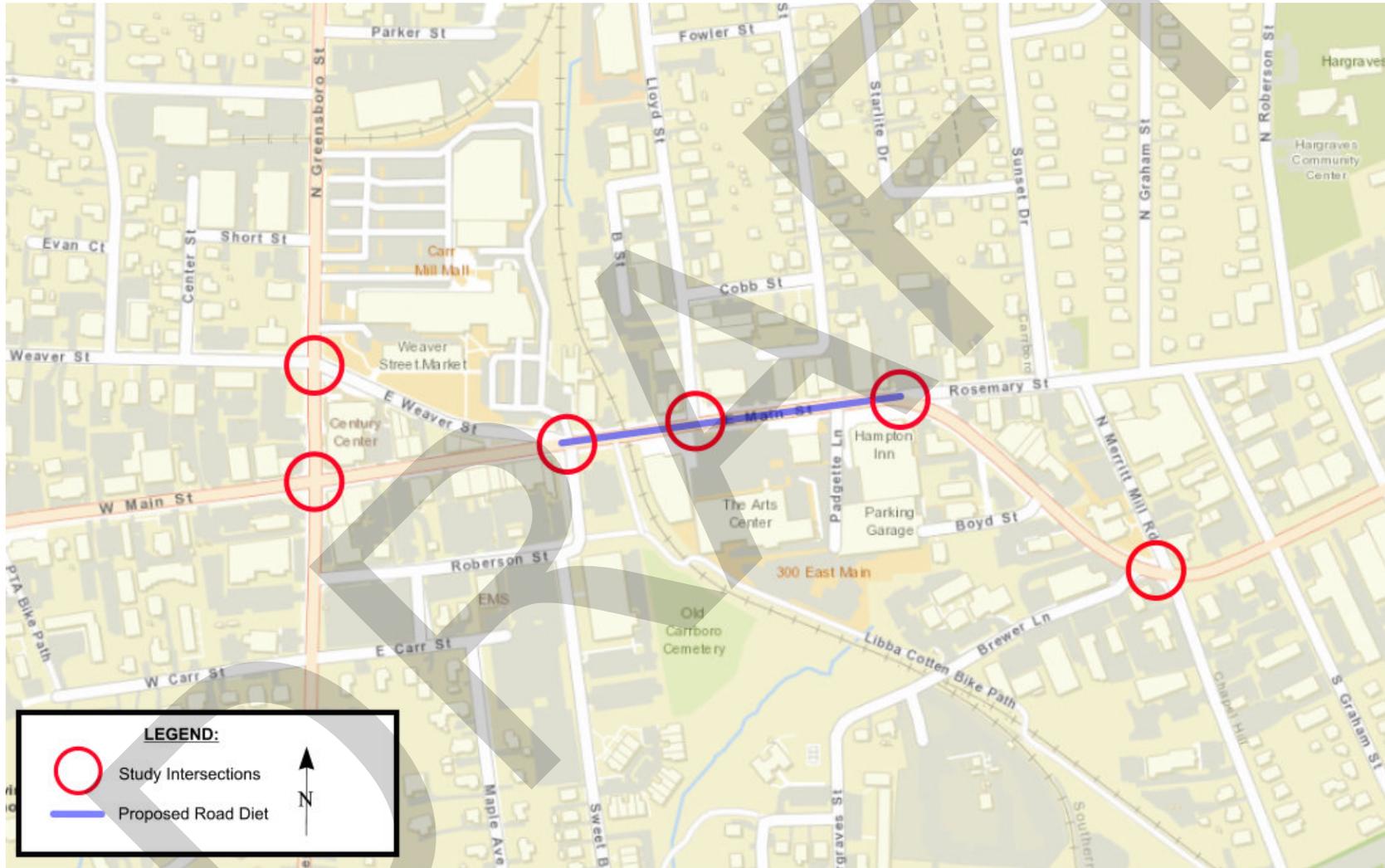


Figure 2: 2017 Volumes

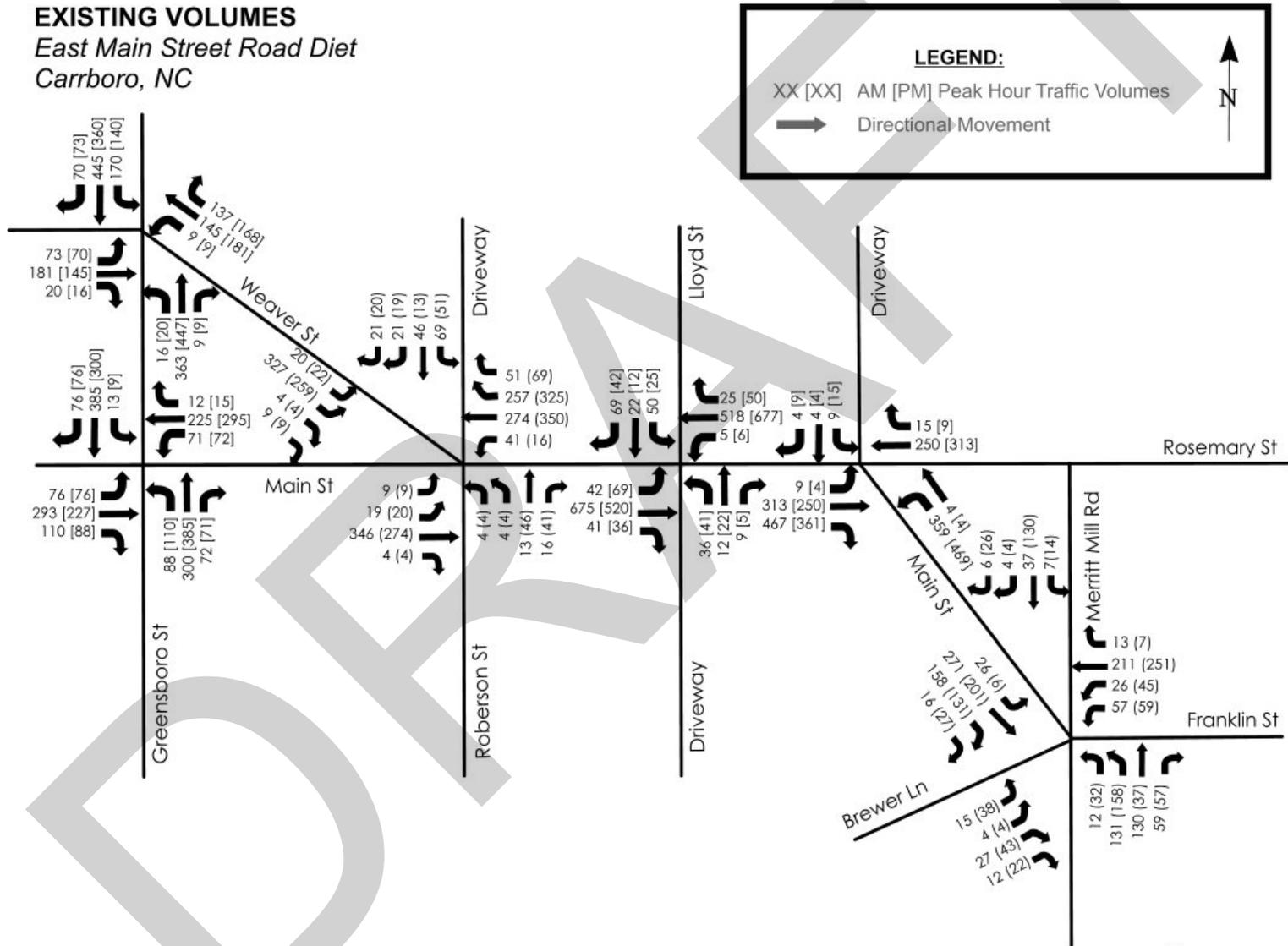


Figure 3: 2030 Volumes – No Build/Build Option 1

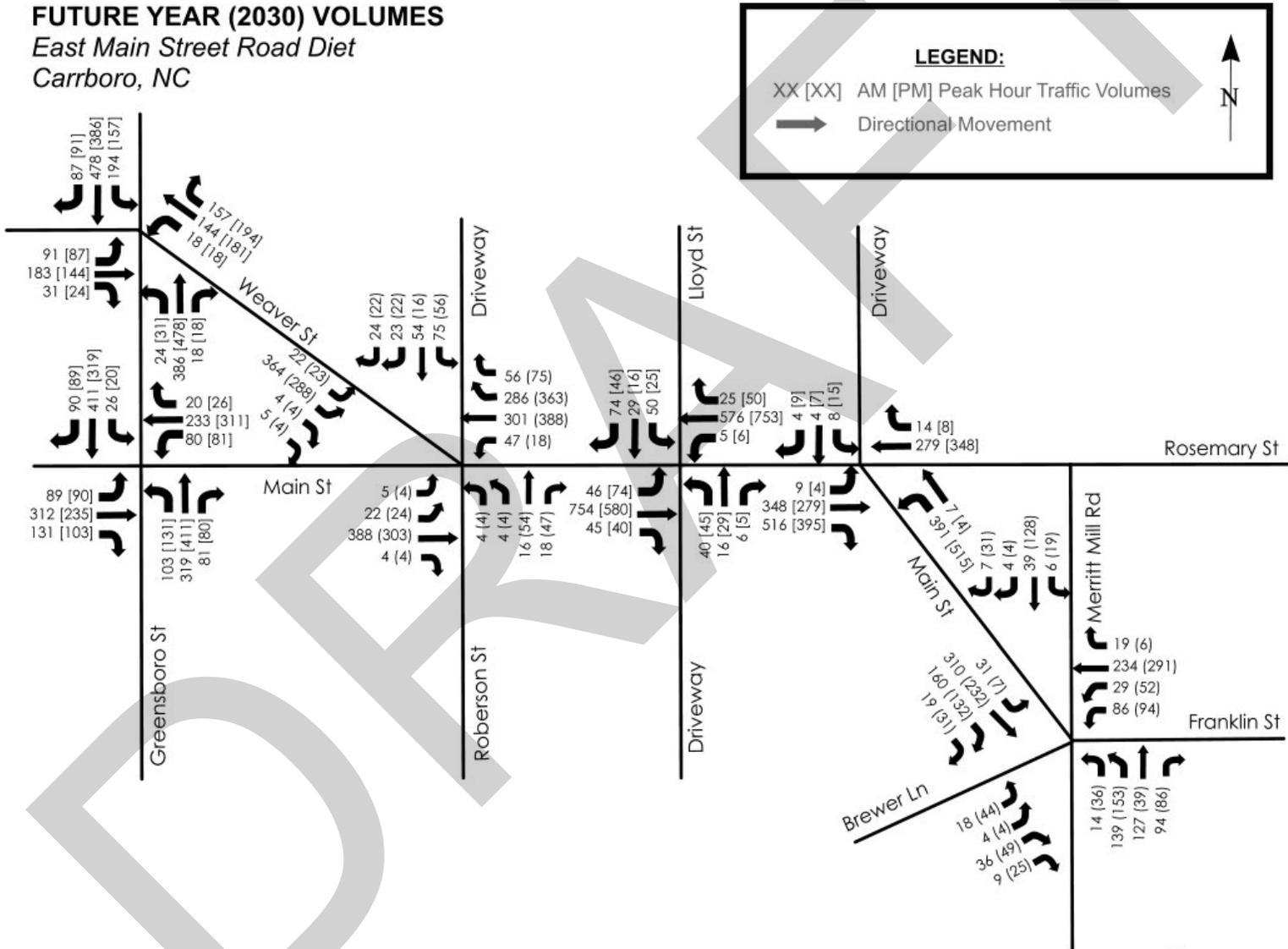


Figure 4: 2030 Volumes – Build Option 2

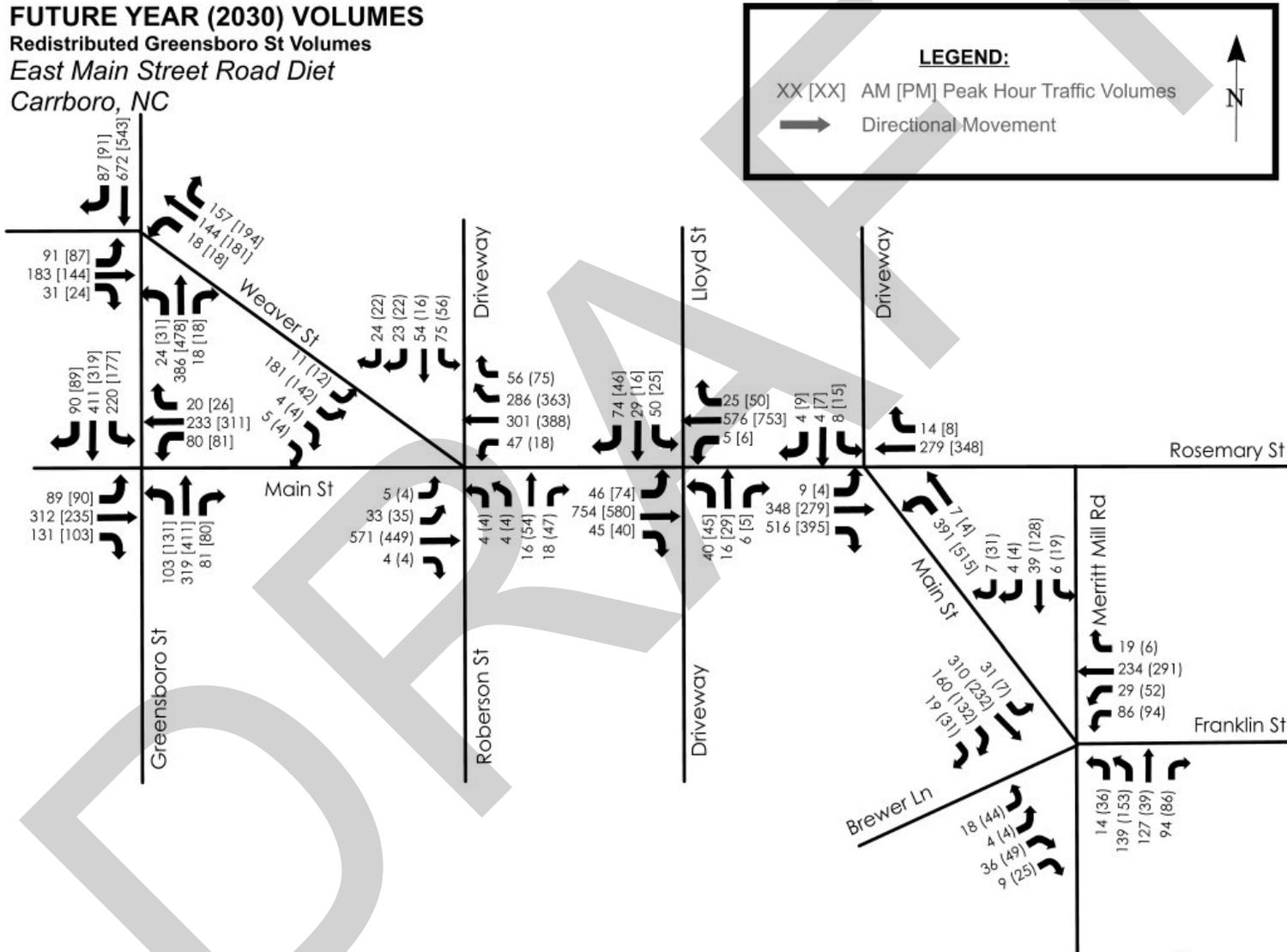


Figure 5: Existing Geometry

**EXISTING LANE GEOMETRY**  
*East Main Street Road Diet*  
*Carrboro, NC*

**LEGEND:**

-  Existing Traffic Signal
-  xx' Storage Length
-  Existing Travel Lane

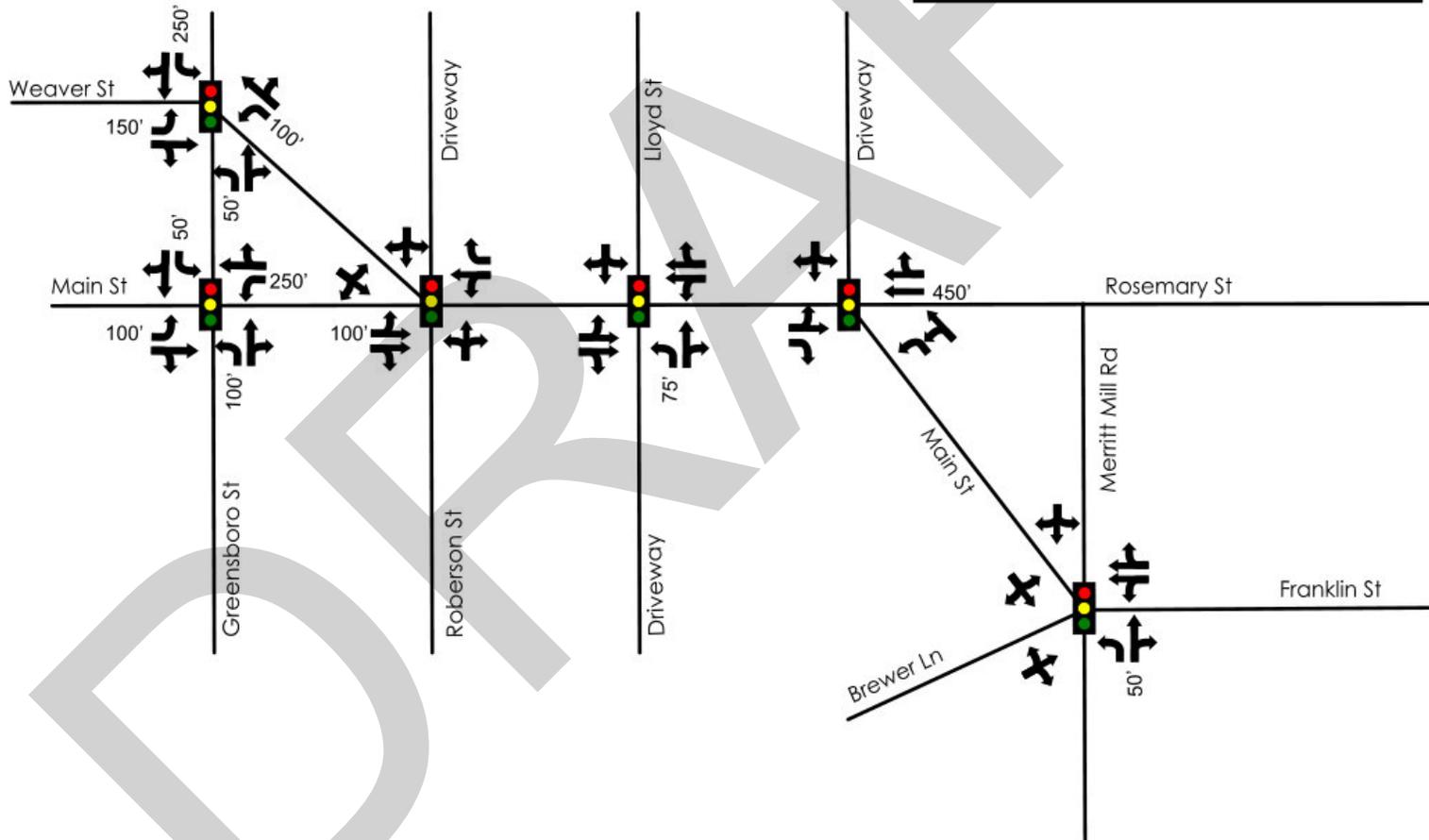



Figure 6: Build Geometry – Build Option 1

**PROPOSED BUILD LANE GEOMETRY - Option 1**

*East Main Street Road Diet  
Carrboro, NC*

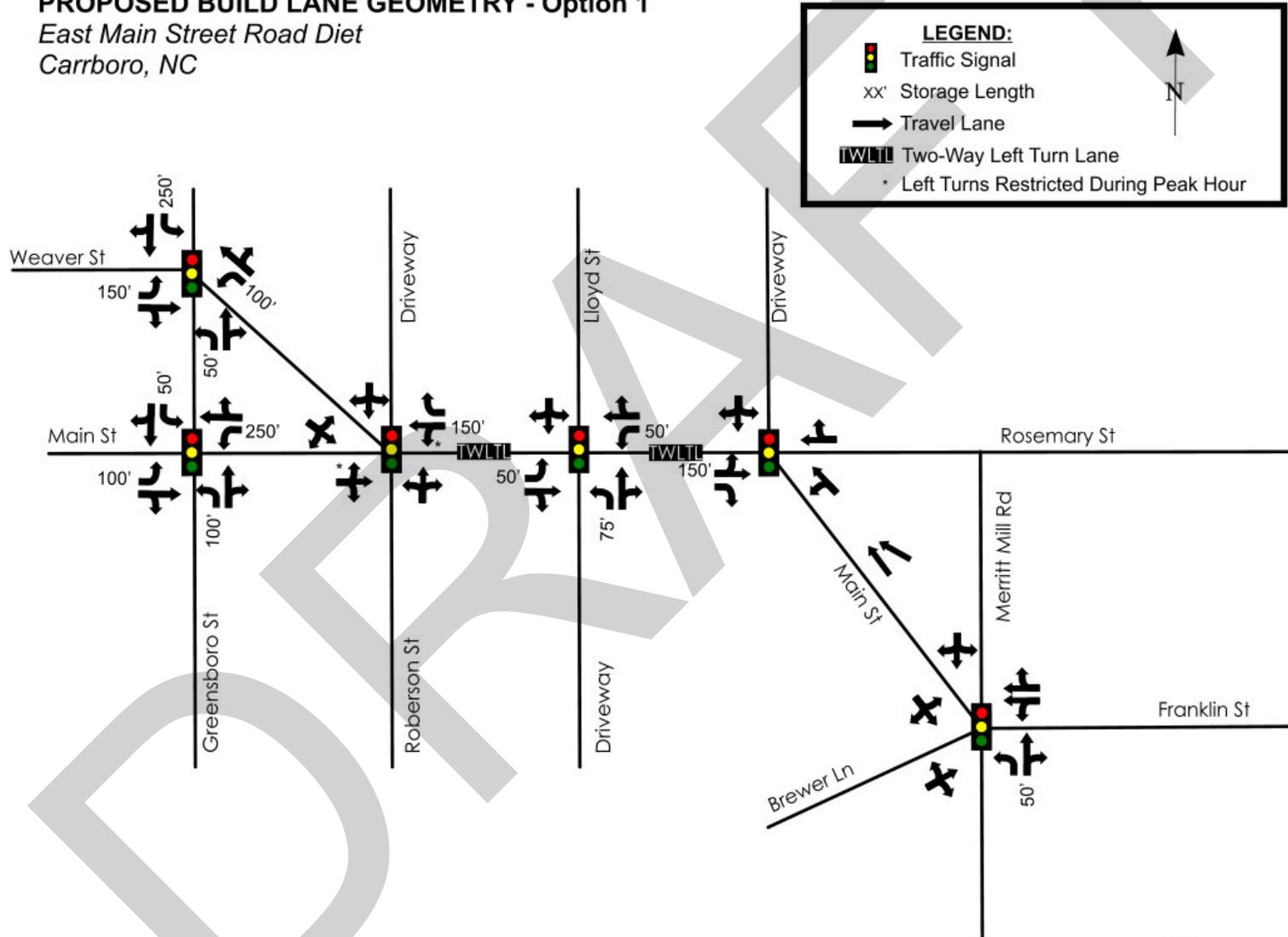


Figure 7: Build Geometry – Build Option 2

**PROPOSED BUILD LANE GEOMETRY - Option 2**

*East Main Street Road Diet  
Carrboro, NC*

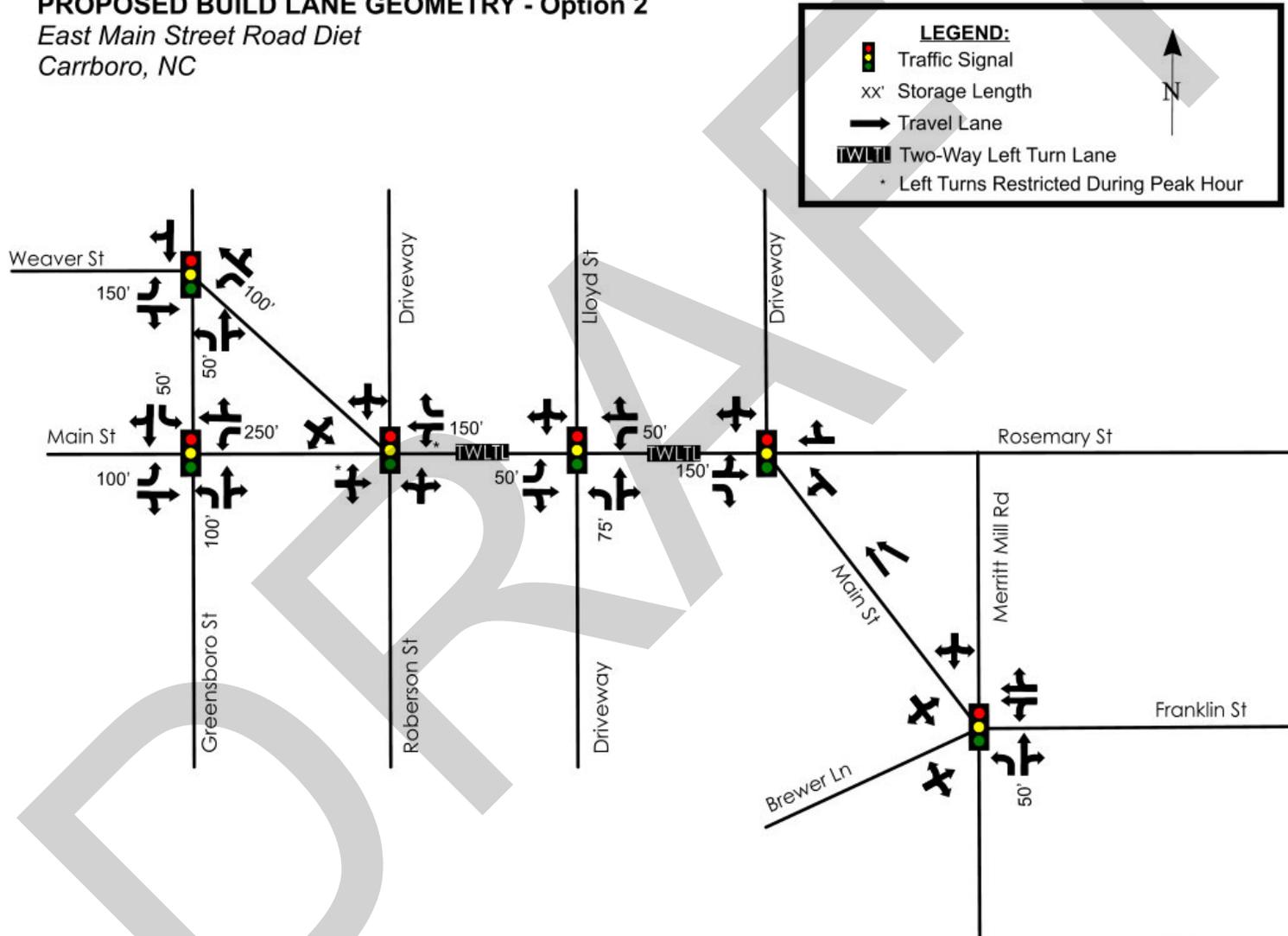


Figure 8: 2017 Existing Level of Service/Delay

**EXISTING LEVEL OF SERVICE/DELAY**  
*East Main Street Road Diet*  
*Carrboro, NC*

**LEGEND:**

X (XX) - LOS (Delay in seconds/vehicle)

- Signalized Intersection

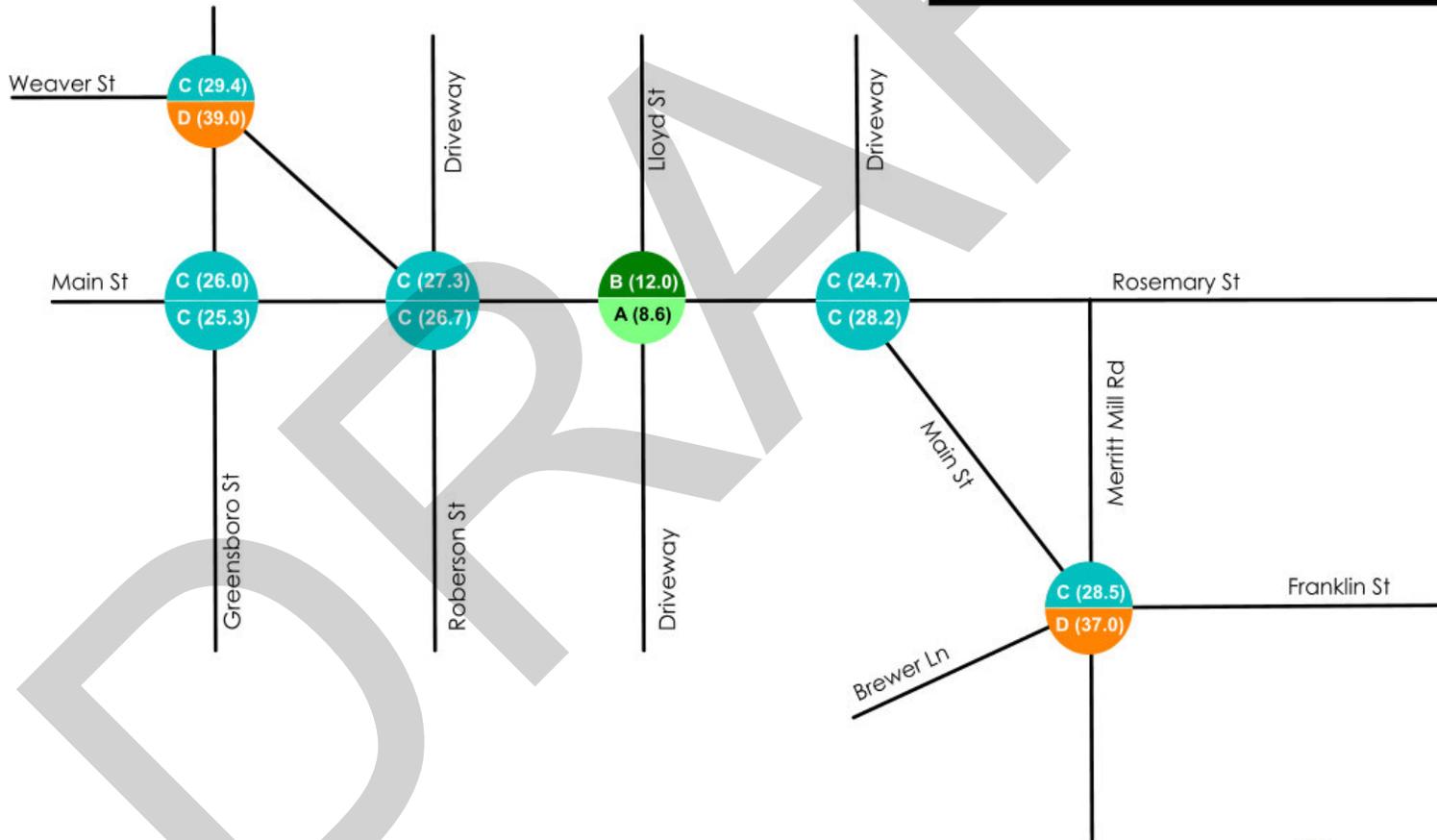


Figure 9: 2017 Build – Option 1 Level of Service/Delay

**2017 BUILD LEVEL OF SERVICE/DELAY - Option 1**

*East Main Street Road Diet  
Carrboro, NC*

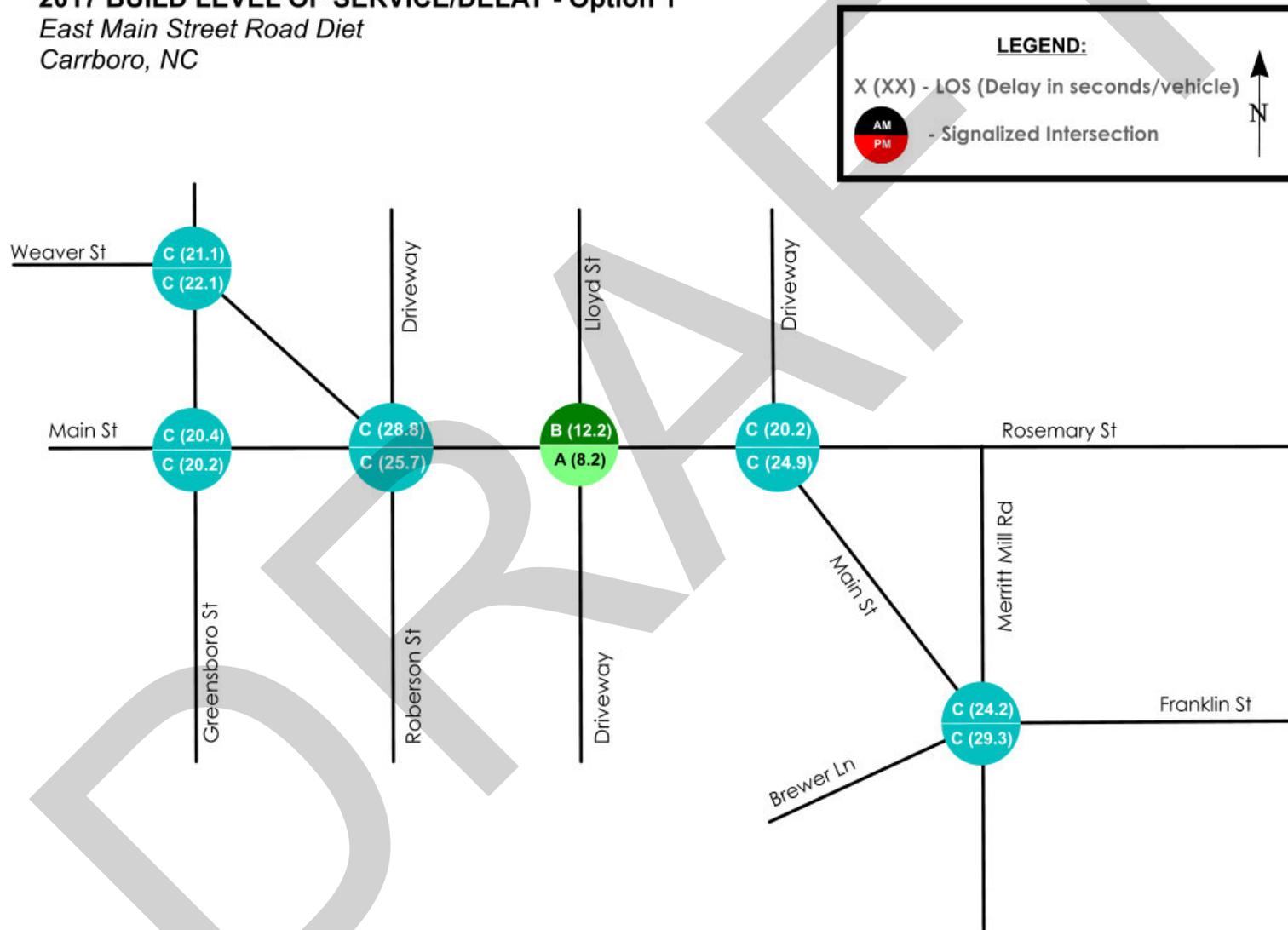


Figure 10: 2017 Build – Option 2 Level of Service/Delay

**2017 BUILD LEVEL OF SERVICE/DELAY - Option 2**  
 East Main Street Road Diet  
 Carrboro, NC

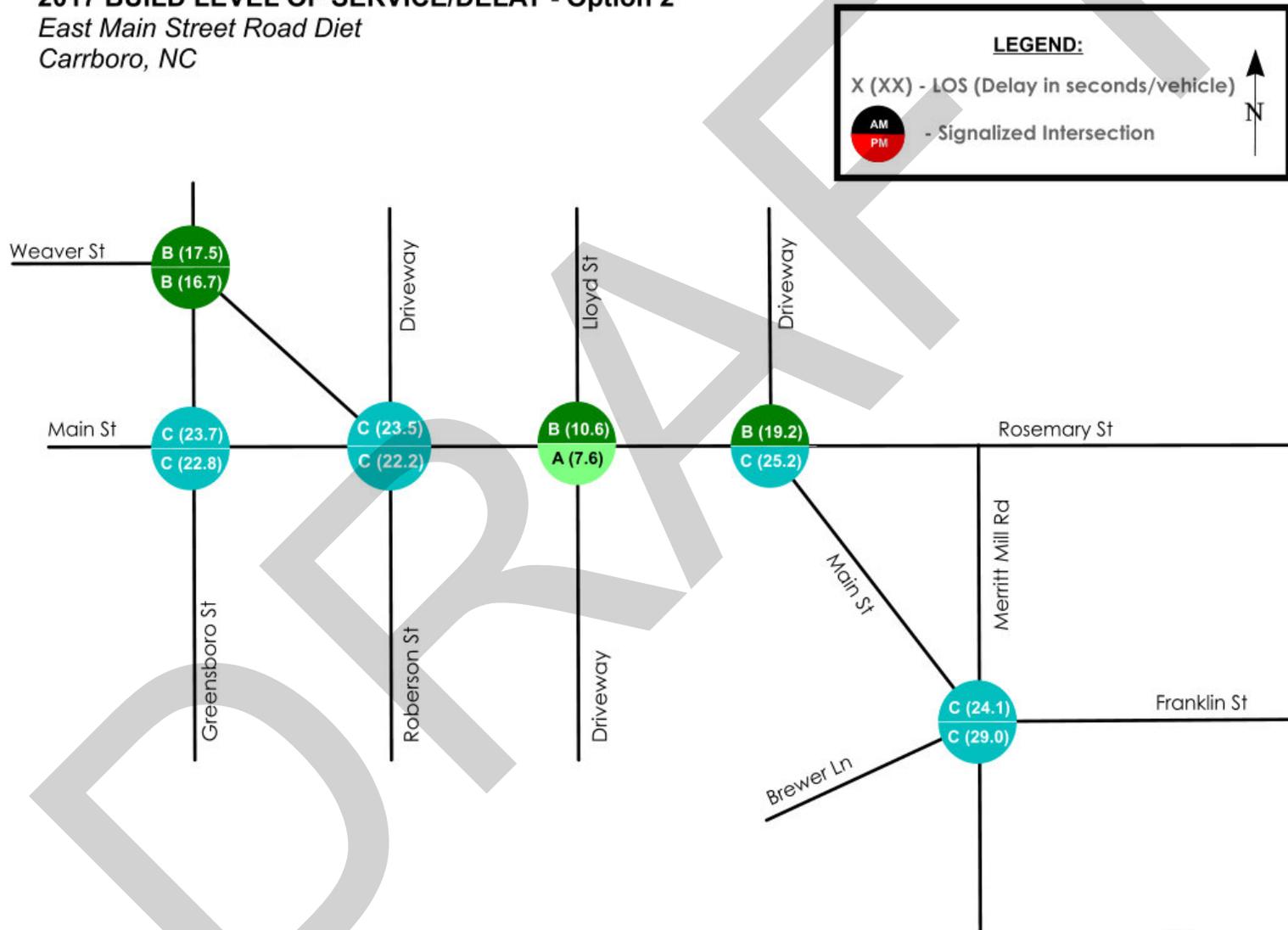


Figure 11: 2030 No Build Level of Service/Delay

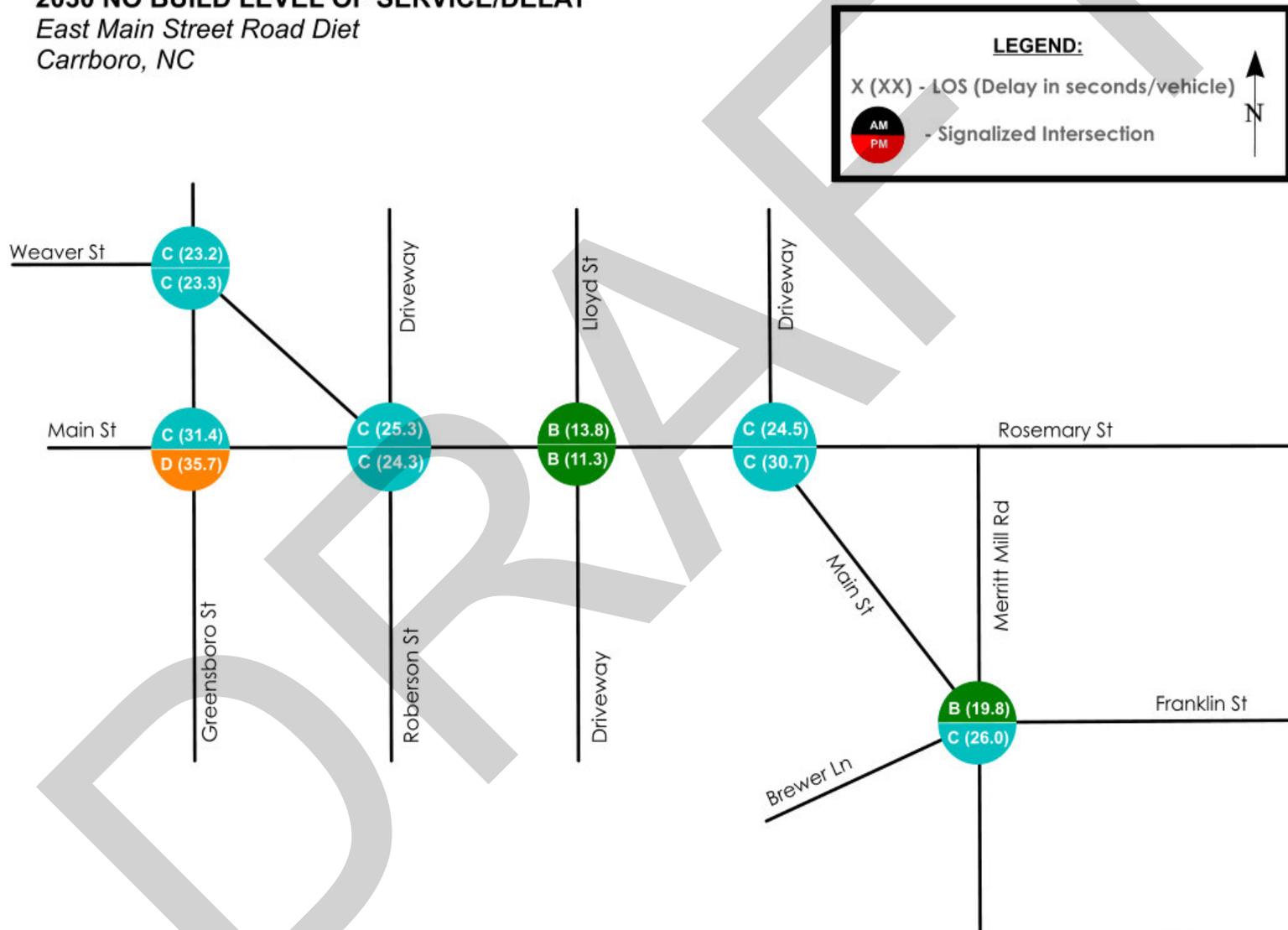
**2030 NO BUILD LEVEL OF SERVICE/DELAY**
*East Main Street Road Diet  
Carrboro, NC*


Figure 12: 2030 Build – Option 1 Level of Service/Delay

**2030 BUILD LEVEL OF SERVICE/DELAY - Option 1**  
 East Main Street Road Diet  
 Carrboro, NC

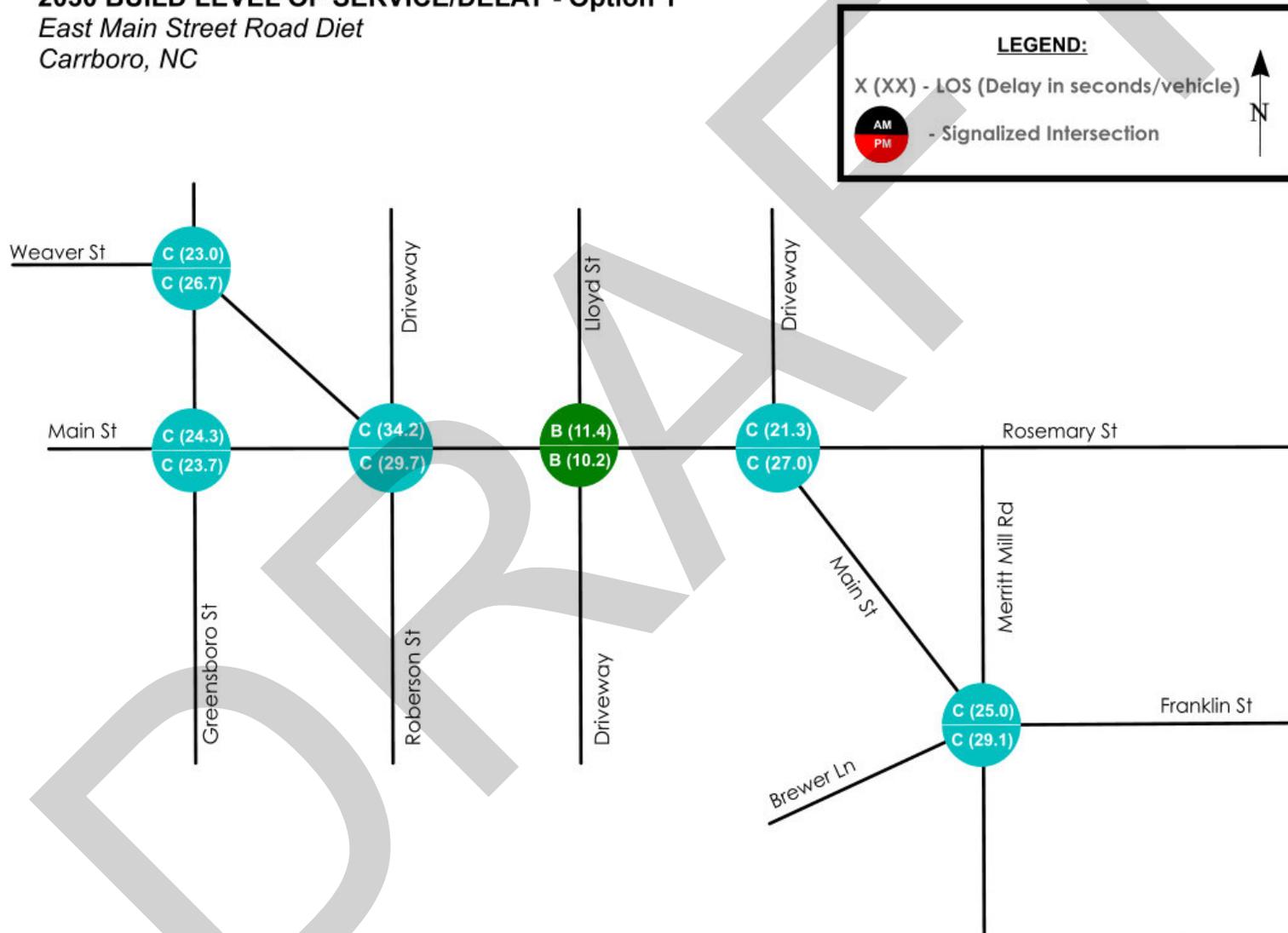


Figure 13: 2030 Build – Option 2 Level of Service/Delay

**2030 BUILD LEVEL OF SERVICE/DELAY - Option 2**  
*East Main Street Road Diet*  
*Carrboro, NC*

