



STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION

BEVERLY EAVES PERDUE  
GOVERNOR

EUGENE A. CONTI, JR.  
SECRETARY

April 3, 2012

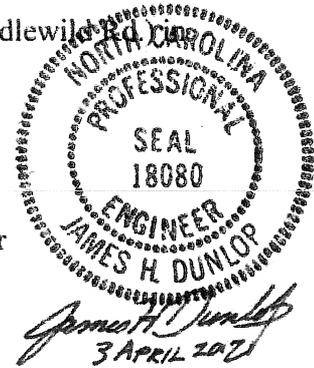
Project: SP-2012-08  
Division: 10  
County: Mecklenburg  
Description: NC 51 (Matthews-Mint Hill Rd.) and SR 3143/ SR3174 (Idlewild Rd.)  
Charlotte

**MEMORANDUM**

**To:** J. Scott Cole, P.E., Division Traffic Engineer  
ATTN: Sean M. Epperson, Deputy Division Traffic Engineer  
Division 10

**From:** James H. Dunlop, P.E., Congestion Management Engineer  
Congestion Management Section

**Subject:** NC 51 (Matthews-Mint Hill Rd.) and SR 3143/SR3174 (Idlewild Rd.)  
Intersection Analysis



As requested, the Congestion Management Section has completed a review of the subject intersection using the traffic counts taken by Davenport Transportation Consulting and received via Division 10. The 2010 Average Annual Daily Traffic (AADT) map indicates Matthews-Mint Hill Road (north-south) carries approximately 18,000 vehicles per day, and Idlewild Road (east-west) carries 15,000 vehicles per day. Both roads are two lane undivided roadway and we assume the geometric layout of this road will not change by the design year. Future analysis was grown at an assumed 1% annual growth rate.

We performed capacity analysis using 110% of the existing base year (2010) traffic volumes to develop design year (2020) traffic volumes. We also performed capacity analysis for the existing (2010) and design year (2020) peak hours using Synchro/SimTraffic, version 7, and for roundabouts using SIDRA traffic analysis software, version 5.

**Base year (2010) analysis**

Based on our analysis, this intersection is operating at an acceptable levels of service (LOS) and v/c ratio; however, due to excessive queuing in the AM/PM peak hour in the base year (2010), this intersection does not function well with existing signal phasing and lane geometry.

**Design year (2020) analysis**

The following intersection configurations were analyzed and compared with each scenario based on existing geometry:

**Scenario 1** – No-Build: Existing lane geometry

**Scenario 2** – Build: Existing lane geometry with added turn lanes and storage

**Scenario 3** – Build: Scenario 2 and add Northbound/southbound through lanes

**Scenario 4** – Build: A multi-lane roundabout

The intersection results for the design year (2020) AM/PM peak hour analysis are shown in the following table:

Year 2020* Peak Hour Intersection Analysis Comparisons (All Queues in Feet)	2020 AM/PM Peak Hour			
	NC 51 (Matthews-Mint Hill Rd.) and SR 3143/3174 (Idlewild Rd.)			
	Scenario 1 (Existing Signal Phasing, Lanes and Storage)	Scenario 2 (Existing Signal; add turn lanes and storage)	Scenario 3 (Scenario 2 and add NB/SB thru lanes)	Scenario 4 (Multi-Lane Roundabout; add thru lanes)
Overall Intersection LOS	D/D	D/D	C/D	B/B
Overall Intersection Delay	40/44	37/41	32/40	15/13.5
Max. Intersection Movement v/c	0.90/0.97	0.89/0.94	0.80/0.90	0.84/0.83
Worst Movement LOS	E/E	D/D	D/E	C/C
Worst Movement 95 <sup>th</sup> Queuing (Synchro/SIDRA) **	694/565 SBTR/NBT	597/565 SBT/NBT	493/541 WBT/NBT	326'/261' SB/NB

\* Based on assumed 1% annual growth rate.

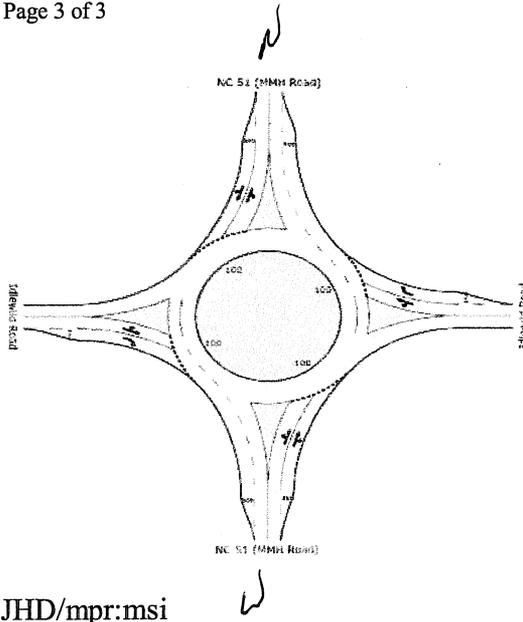
\*\* 95th percentile queues from Synchro for signals (Scenario 1, 2, and 3) and SIDRA for roundabout (Scenario 4).

**Scenario 1:** Analysis of the existing roadway network under design year (2020) No-build traffic volumes indicates that the eastbound and westbound through lanes are anticipated to operate at poor levels of service (LOS) with significant queuing and delays in the AM/PM peak hours.

**Scenario 2:** This intersection is anticipated to operate at an acceptable level of service (LOS) “D” or better; however, because of excessive queuing and delays in the AM/PM peak hour, we do not recommend this scenario.

**Scenario 3:** The eastbound through lane is anticipated to operate at a poor levels of service (LOS) with significant queuing and delays in the PM peak hour. NC 51 (Matthews-Mint Hill Road) would require adding a through lane in each direction.

**Scenario 4:** Roundabouts are expected to approach capacity once a movement operates at a volume-to-capacity (v/c) ratio greater than 0.85. A roundabout should operate at acceptable levels of service (LOS) and volume-to-capacity ratio (v/c) at least ten (10) years beyond construction of the roundabout. Based on 1% annual growth rate, this multi lane roundabout should work with an acceptable LOS and queuing beyond 10 years from the base year 2010, with laneage as shown in the diagram below.



**In conclusion,** based on our analysis, **Scenario 4** (dual lane roundabout) is the better alternative compared to all other alternatives and provides acceptable operations more than ten years from base year 2010. Therefore, therefore, we recommend installing a dual lane roundabout at this intersection.

If you have questions regarding this analysis, or if further analysis is requested, please contact me or Congestion Management Project Engineer Michael P. Reese, P.E., at (919) 773-2800.

JHD/mpr:msi

- cc: B. S. Moose, P.E.
- T. M. Bruton, P.E.
- G. E. Brew, P.E.
- J. K. Lacy, P.E., C.P.M.
- M. P. Butler, P.E.
- M. P. Reese, P.E.
- M. S. Islam, P.E.

APRIL 13 YEARS PAST ROUND-OUT

OUT TO ~ 2023

EW. \$1.0M +/-

100' DIAMETER

60' LANES