Martin / Alexiou / Bryson, PLLC
Transportation Planning
Traffic Engineering

MEMORANDUM

To: Joey Hopkins, PE, NCDOT Division 5
CC: Jim Dunlop PE, NCDOT Congestion Management
Michael J. Kneis , PE, NCDOT Division 5
Wesley Parham PE, City of Durham
From: Andrew Topp, P.E., Martin/Alexiou/Bryson
Date: June 12, 2007
Subject: Erwin Road (SR 1320) Restriping

Introduction

As discussed during our meeting on May 14th, NCDOT plans to resurface Erwin Road (SR 1320) from Cameron Boulevard (NC 751) to Main Street this summer. Barnhill Contracting Company is under contract to perform the repaving and expects to start in late July. As part of this resurfacing, we understand there is an opportunity to make improvements to the roadway to enhance bicycle, pedestrian, and driver safety. Since the project is underway and under contract, we understand that improvements are generally limited to modifying pavement markings, rather than additional construction, such as addition of a median, roadway widening, signal/signing improvements, etc. The following three improvement opportunities were specifically discussed during the meeting:

- Restriping east of Anderson Street to accommodate three lanes rather than four lanes
- Adjusting the lane widths of inside lanes to allow for a wider outside lane for bicyclists
- Use of high visibility crosswalks at certain locations

As we agreed in the meeting, M/A/B has explored the possibility of these improvements and has made general recommendations in each of these areas.

Restriping East of Anderson Street

Erwin Road, as it travels east, transitions from a five-lane roadway to a 4-lane undivided roadway, then to a three-lane roadway just before Pettigrew Street. NC 147 previously ended at Erwin Road and its traffic onto Erwin Road resulted in the need for four travel lanes. Once NC 147 extended to the north along its present alignment, the non-local traffic now remains on NC 147 and the traffic volume along the eastern portion of Erwin Road is relatively low. Only one through lane in each direction is needed to accommodate the future traffic. As a result, it is recommended to modify the four-lane undivided section to a three-lane section. The three-lane section would allow separation of the opposing through lanes, provide space for an exclusive left-turn lane, and would allow more room for bicyclists and possibly on-street parking. The two westbound lanes would essentially be converted to a through and two-way left-turn lane and one lane will be maintained in the eastbound direction. At Anderson Street, the outside through-right lane in the eastbound direction would be restriped to an exclusive right-turn only lane. The second westbound through lane would be added just prior to the Anderson Street signal.

Figure 1 on the following page illustrates two possible typical sections for the existing 44-foot (edge to edge) section. Option #1 provides on-street parking on the southern side of Erwin Road with wide outside travel lanes to help accommodate bicyclists. Option #2 provides a 4-foot striped bicycle lane on either side of the roadway. Conceptual striping plans contained in the Appendix provide plan view illustrations of the new striping.

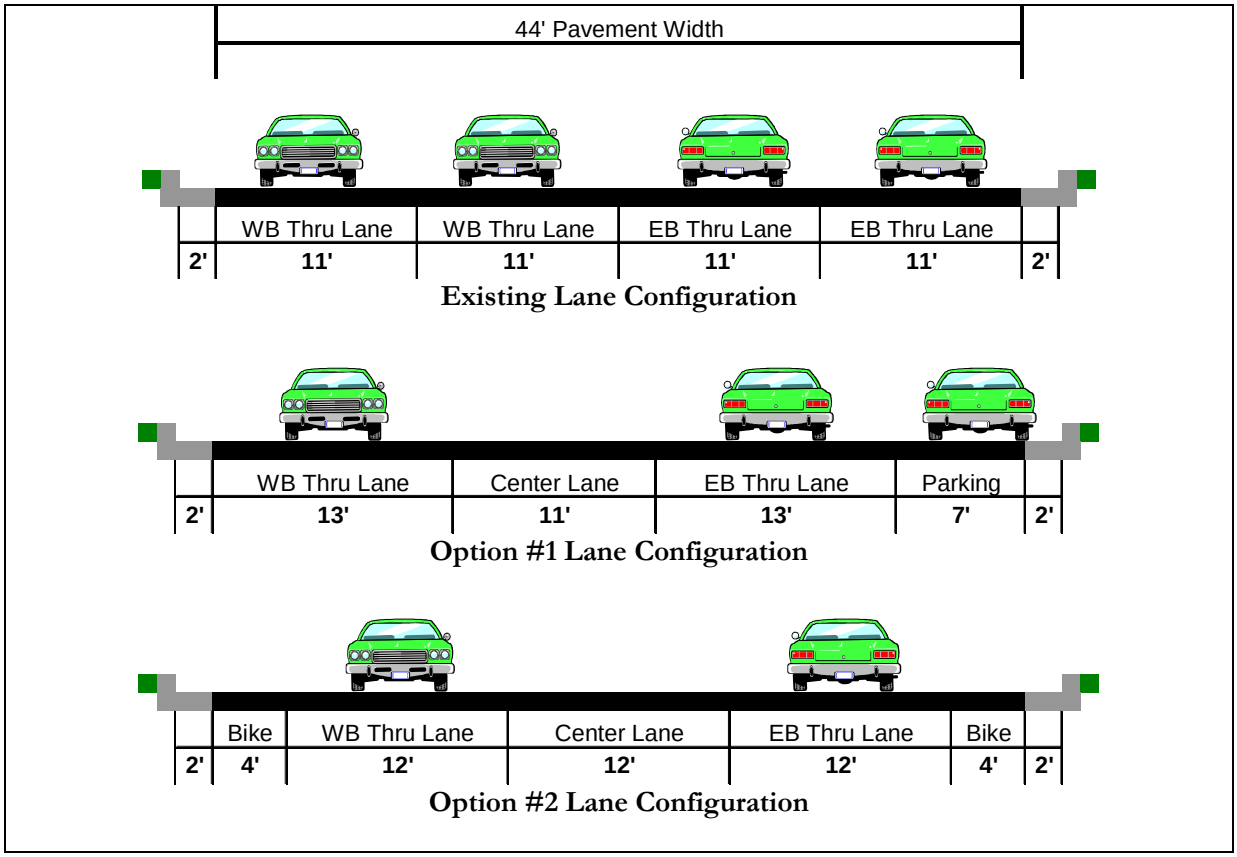


Figure 1: Restriping East of Anderson Street

Both options will provide a buffer between the travel lanes, better accommodate bicyclists, and allow space for left-turning vehicles. Option #1 provides a better transition across Anderson Street as the dropped left-turn lane is opposite the parking lane with all other lanes generally aligned. The four-foot bicycle lane in Option #2 shifts all other lanes to the south misaligning them somewhat from the lanes west of Anderson Street, however this could be improved somewhat with mini-skip lines. Also the parking lane will reduce the travel width and possibly discourage excessive travel speeds as drivers travel east or west towards heavily pedestrian/bicycle areas near Duke or Ninth Street. Lower vehicle speeds along Erwin Road would help to reduce stopping sight distance and possibly improve the high crash rate (744 crashes per 100 million vehicle miles traveled) along Erwin Road, which exceeds statewide averages for similar facilities. In addition, Erwin Road travels through a heavily concentrated pedestrian area, particularly at Fulton Street where over 400 pedestrians cross at-grade during the P.M. peak hour. In addition, and as was discussed during our meeting, a full 4 or 5-foot bicycle lane will be very difficult to achieve to the west due to limited pavement width, right-of-way, possibility of a future median, and available frontage space. As a result, providing a continuous wide outside lane the entire length of Anderson Street may be preferable to a partial striped bike lane section.

Lane Width Adjustments

For these types of resurfacing projects, the lane lines are typically just replaced in the same location. As was recommended during the meeting, we took some lane measurements and have evaluated opportunities for shifting lane lines to improve safety or better accommodate bicyclists. Except at locations were additional right-turn lanes are present, the Erwin Road cross-section is generally 56-foot or 52-foot for most of its length. Since the lanes are already somewhat narrow, there is limited opportunity to restripe wide shared facility bicycle lanes.

<u>56-foot Section</u> (Between Fulton Street and Anderson Street)

The pavement is 56-feet wide from edge to edge along this section, with the exception of where a westbound right-turn lane is present at Fulton Street. As shown in Figure 2, a 12-foot outside lane can be accommodated by reducing the width for the inside through lanes. This provides some additional

space for vehicles in the outside lane to pass bicyclists while maintaining the 12-foot center lane. Although this is slightly better for bicyclists than current conditions, the road still does not meet the desirable widths to be considered a shared-use, wide outside lane.

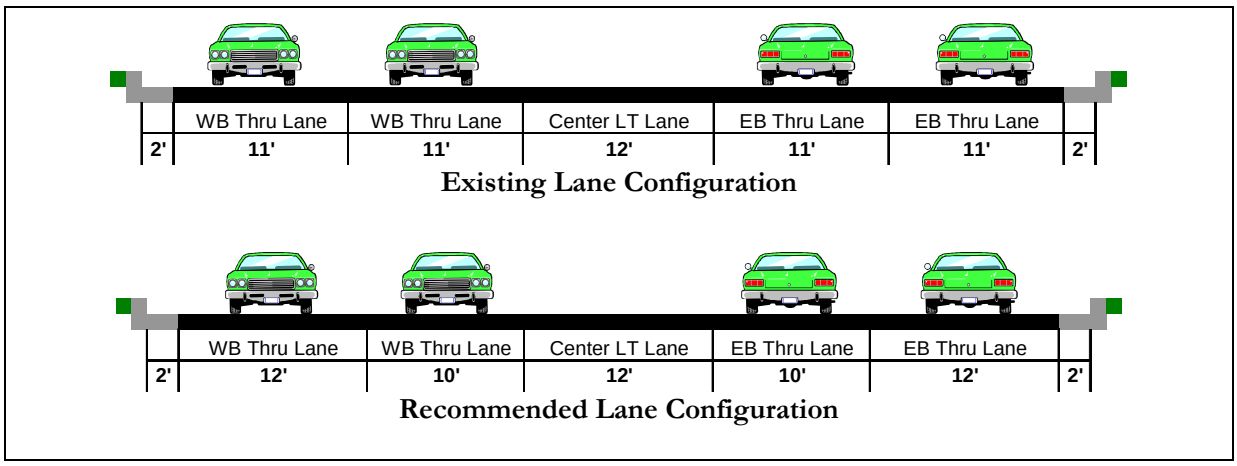


Figure 2: 56-Foot Section (Between Fulton Street and Anderson Street)

Reducing the center left-turn lane to 10' would allow another foot of pavement to be dedicated to each outside lane; however this is not recommended as it reduces the buffer for the relatively high numbers of left-turning vehicles.

52-foot Section (Between NC 751 and Eye Care Center Drive)
As shown in Figure 3, all through lanes are already narrow and as a result, additional pavement cannot be easily dedicated for wider outside lanes. As a result, no modifications are recommended along this section.

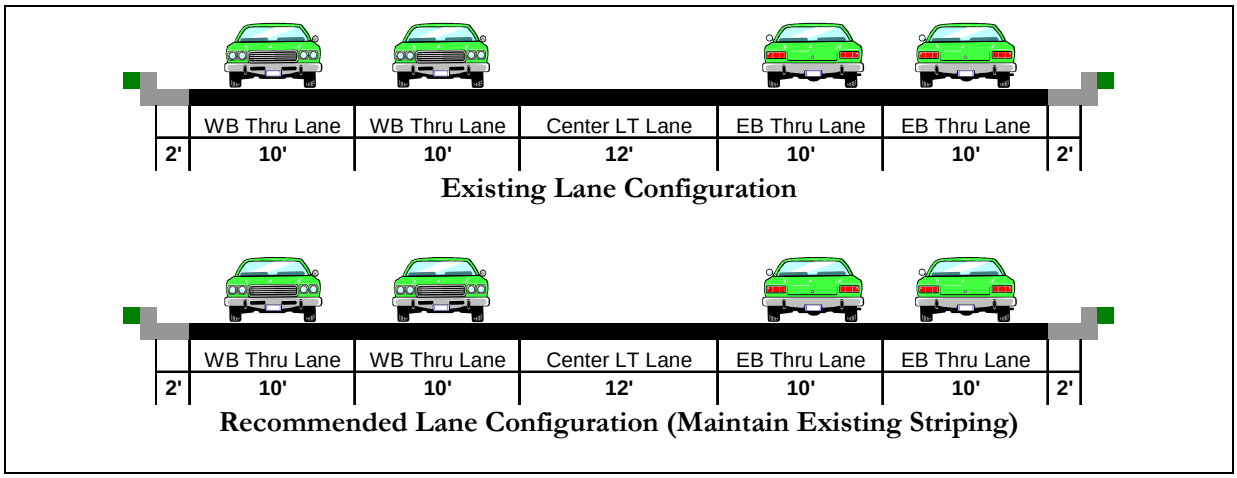


Figure 3: 52-Foot Section (Between NC 751 and Eye Care Center Drive)

Paving within the gutter area may be considered, which would provide an additional two feet on either side for bicyclists or wider lanes. Evaluation of the drainage grates is required to ensure that they are safe to bicyclists and flush with the roadway surface.

Crosswalks
Presently the high visibility or striped, ("zebra") longitudinal crosswalks are only present at Fulton Street with standard crosswalks at all other signalized intersections. It is recommended to continue to use high visibility, thermoplastic crosswalks at this intersection. We also recommend the use of high visibility crosswalks at the other signalized intersections. The primary advantage of using this type of marking is its high visibility, which increases driver's awareness of the crossing. The disadvantage is the higher cost and having too many high visibility crosswalks may potentially render them less effective at the highest

pedestrian volume locations. The Appendix contains a figure that illustrates the vehicular and pedestrian volumes counted at the major intersections along Erwin Road. Three-year crash data (2004-2006) for Erwin Road report nine pedestrian or bicycle crashes along Erwin Road. Table 1 summarizes the pedestrian volumes and crash history at each of the main intersections along Erwin Road.

Table 1: Pedestrian Volumes/Crashes at Erwin Road Intersections

Intersection	Control	Crossing Pedestrian Volume				Pedestrian/Bicycle Crashes Reported (Type Injury)
		Erwin Road		Side Street		
		A.M.	P.M.	A.M.	P.M.	
NC 751	Signalized	4	3	6	8	None
Morreene/Towerview	Signalized	3	2	5	18	1 bicycle crash (B)
Lambeth Circle	Unsignalized	N/A	N/A	N/A	N/A	1 pedestrian crash (C)
LaSalle Street	Signalized	11	12	103	140	3 pedestrian crashes (C, A, C)
Research/Douglas	Signalized	32	47	14	13	2 pedestrian crashes (B, B)
Eye Care Center/VA	Unsignalized	43	61	8	11	1 bicycle crash (B)
Fulton Street/Hospital	Signalized	268	405	37	43	None
Emergency Drive	Unsignalized	129	138	58	97	None
Trent Drive	Signalized	45	59	26	20	None
Flowers Drive	Unsignalized	8	12	59	63	None
Anderson Street	Signalized	46	52	12	9	None
Main Street	Signalized	18	11	35	9	1 pedestrian crash (B)

Based on the above data, the LaSalle and Research/Douglas intersections are the strongest candidates for new high visibility crosswalks due to crash history. Anderson Street, Trent Drive and Main Street may also be candidates due to pedestrian volume and crash history.

Although it is outside of the scope of this repaving, some kind of pedestrian treatment should be considered at the unsignalized Emergency Drive intersection. Over 120 pedestrians were counted crossing Erwin Road during the A.M. and P.M. peak hours. Since it is at an unsignalized intersection, discretion should be used in placing a crosswalk (and since it is at the crest of hill, pavement markings may have limited effectiveness), however given the high volume of pedestrians, countermeasures such as increased signage, a pedestrian refuge island, or signalization may be considered in the future.

Other general recommendations

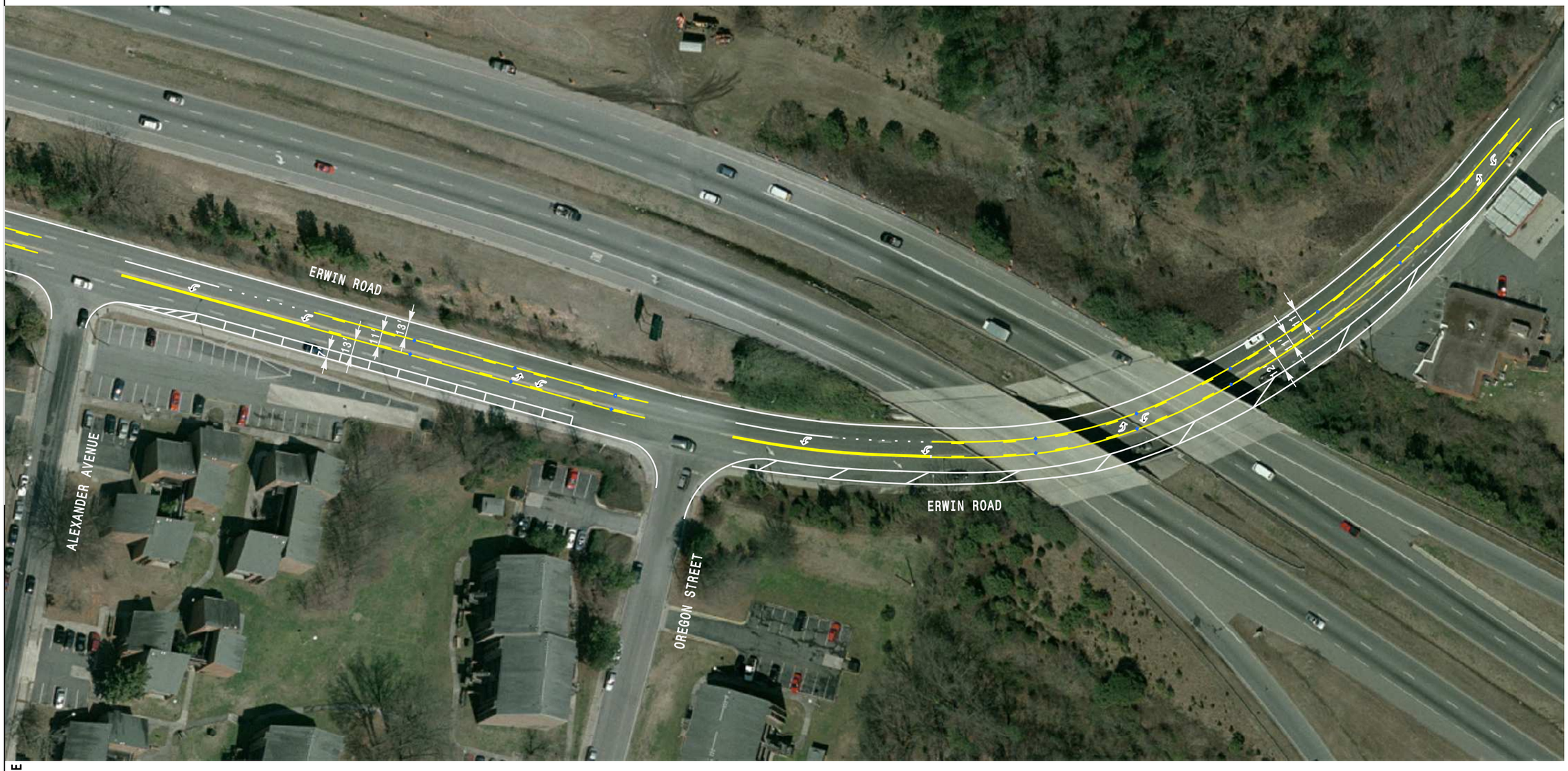
- Coordinate crosswalk painting with wheelchair ramp locations. At some locations, the existing crosswalks do not presently align with the wheelchair ramps. A caution for moving crosswalks however is that they may lengthen crossing distance or affect the stop bar locations (4-foot minimum from crosswalk), which in turn affects loop placement as well as clearance calculations.
- Assuming no paving within gutter pan, it is recommended to mill adjacent to the gutter so that the new pavement is flush with the gutter pan. This will help improve bicycle safety.

APPENDIX

SCALE
0 80
1"=80'

ERWIN ROAD STRIPING PLAN
OPTION 1
SHEET 1 OF 2

MATCH LINE



MATCH LINE

SCALE
0 80
1"=80'

ERWIN ROAD STRIPING PLAN
OPTION 1
SHEET 2 OF 2

SCALE
0 80
1"=80'

ERWIN ROAD STRIPING PLAN
OPTION 2
SHEET 1 OF 2

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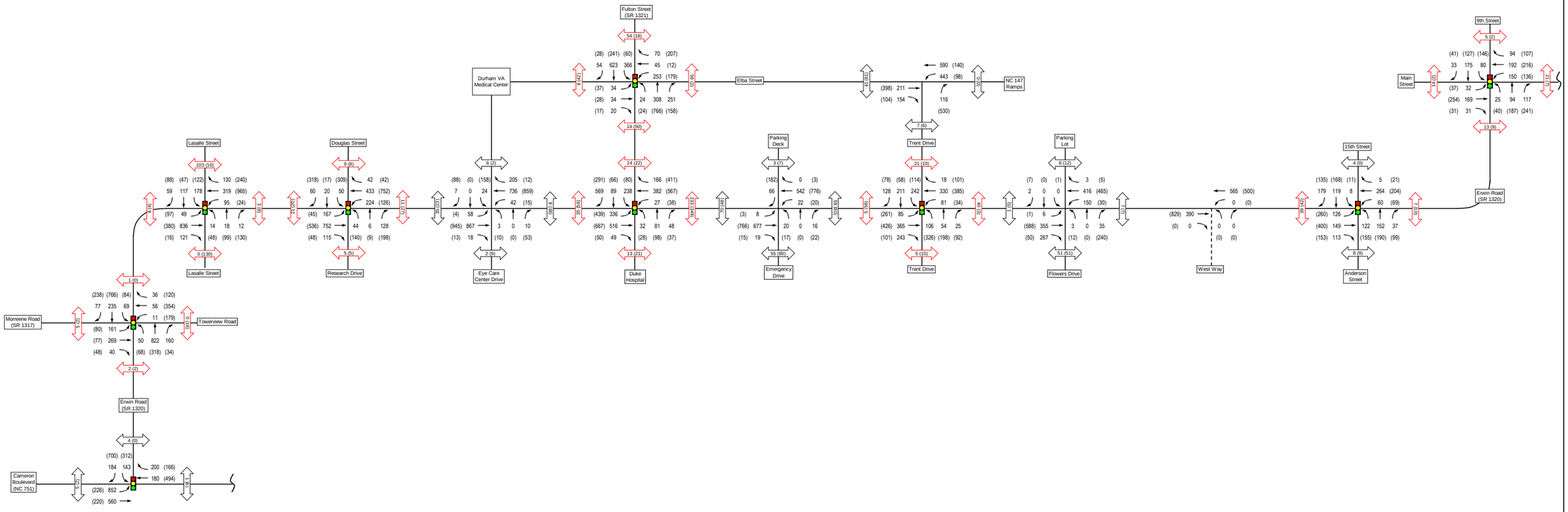
MATCH LINE

MATCH LINE

SCALE
0 80
1"=80'

ERWIN ROAD STRIPING PLAN
OPTION 2
SHEET 2 OF 2



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Erwin Road (SR 1320)
Durham, North Carolina

Figure 4
Existing (2007) A.M. and P.M. Peak Hour Turning Movements and Pedestrian Volumes