
INTRODUCTION

This report summarizes the findings of a Continuous Flow Intersection (CFI) study at the intersection of Beechmont Avenue (SR 125) and Five Mile Road located in Anderson Township, Hamilton County, Ohio. The intersection was analyzed to determine the feasibility of the CFI concept for the approaches on Five Mile Road at the intersection under the existing and 20 years projected traffic.

The original CFI concept was developed several years ago to increase capacity at the major intersecting roadways. It accomplishes this by moving the left-turning vehicles with opposing traffic several hundred feet prior to the main intersection. By doing so, left turning vehicles are allowed to travel simultaneously with opposing traffic to a point at the main intersection. More time can be assigned to the green phase of through vehicles, which increases the overall vehicular capacity of the intersection.

Existing Conditions

The intersection of Beechmont Avenue and Five Mile Road is operating with a traffic signal installed at this location. On an average weekday about 65,000 vehicles pass through this intersection. On all approaches, two lanes are provided for the through traffic. Exclusive lanes for the left and right turns are available on all approaches except for the eastbound approach, which is operating with a shared lane for the through and right turns. Based on the information provided by the Ohio Department of Transportation, plans for providing an exclusive right turn lane for the eastbound approach are being developed and it is expected that the construction of an exclusive right turn lane will be completed in the near future. The intersection is located in an area with significant retail and commercial development and also provides access to I-275 through an interchange on Five Mile Road south of the intersection. Therefore, significant traffic volumes are observed at this location throughout the day. However, the heaviest traffic volumes are encountered during morning and evening peak hours, particularly during the evening peak hour.

The accidents recorded at the intersection are among the highest recorded at any intersection in all of Hamilton County. **Table 1** below summarizes the accidents recorded at the intersection for years 2002, 2003 and 2004.

Table 1. SUMMARY OF ACCIDENTS

YEAR	BEECHMONT (SR 125) APPROACHES	FIVE MILE APPROACHES	TYPE OF ACCIDENT					TOTAL
			REAR END	LEFT TURN	SIDE SWIPE	ANGLE	OTHERS	
2002	20	22	25	9	5	2	1	42
2003	28	19	26	11	3	5	2	47
2004	24	21	31	11	0	2	1	45

Methodology

The traffic models for the intersections are created using VISSIM software (Version 4.1). VISSIM is a microscopic, time-step and behavior-based simulation program. It analyzes traffic operations, which are influenced by several factors including roadway geometry, traffic composition, and traffic signals. Models for the intersection of Beechmont Avenue and Five Mile Road were developed for the existing and year 2025 AM and PM peak periods. Using these models the results were compared with and without CFI configuration on Five Mile Road approaches. Output files from VISSIM were generated to evaluate operational performance in terms of average intersection delays and maximum queue length on intersection approaches.

Analysis and Results

Table 2 below summarizes the results of the analysis completed for the year 2004 traffic at the intersection of Beechmont Avenue and Five Mile Road for the existing conditions and with CFI configuration on Five Mile Road approaches. The results of the analysis showed excessive delays during morning and evening peak periods when analyzed with existing traffic and geometry. The intersection is operating with an average delay of 73.6 seconds/vehicle during PM peak hour with maximum queue of about 1674 feet observed for the eastbound approach. During the morning peak period, the intersection is operating at LOS E with an average delay of 63.6 seconds/vehicle.

**Table 2 : Summary of Analysis - Year 2004 Traffic
SR 125 / Beechmont and Five Mile Road
PM Peak Hour**

	Current Geometry			CFI Geometry		
	LOS	Avg Delay (s)	Max Queue (ft)	LOS	Avg Delay (s)	Max Queue (ft)
Northbound	D	38.2	346	C	29.49	384
Southbound	E	72.3	486	C	30.93	287
Eastbound	F	127.9	1674	C	23.99	373
Westbound	D	35.2	809	C	24.36	530
Overall	E	73.6		C	26.35	

AM Peak Hour

	Current Geometry			CFI Geometry		
	LOS	Avg Delay (s)	Max Queue (ft)	LOS	Avg Delay (s)	Max Queue (ft)
Northbound	D	42.9	476	C	28.68	340
Southbound	D	44.6	374	C	29.78	304
Eastbound	F	115.9	1171	C	21.53	258
Westbound	D	50.4	861	C	24.55	455
Overall	E	63.6		C	25.70	

The analysis completed with CFI approaches on Five Mile Road showed significant improvement in the flow of traffic as well as reduction of the queue lengths. During the PM peak period the average delay of 26.35 seconds/vehicle with LOS C was observed for the intersection. During AM peak hour, average delay of 25.7 seconds/vehicle with LOS C is observed for the intersection.

Figures 1 and 2 show the intersection layout under existing conditions and with two-legged CFI configuration, respectively and are attached at the end of this report.

The results of the analysis completed for the year 2025 traffic are summarized in **Table 3**. The analysis completed with existing geometry showed excessive delays and congestion on all approaches to the intersections. The delays are so excessive that the results obtained are meaningless and are not included in **Table 3**. When analyzed with CFI configuration the results show an average delay of 36.9 seconds/vehicle with LOS C. During the PM peak hour, an average delay of 29.8 seconds/vehicle with LOS C is observed.

**Table 3 : Summary of Analysis - Year 2025 Traffic
SR 125/Beechmont and Five Mile Road
CFI Configuration**

	AM PEAK Period			PM Peak Period		
	LOS	Avg Delay (s)	Max Queue (ft)	LOS	Avg Delay (s)	Max Queue (ft)
Northbound	C	28.29	356	C	26.30	377
Southbound	C	26.98	582	C	27.60	254
Eastbound	C	25.02	572	C	26.91	395
Westbound	C	27.73	251	D	37.48	915
Overall	C	26.9		C	29.84	

This report does not include the analysis of the intersection with four-way CFI configuration since CFI configuration on Beechmont Avenue approaches will have a significant impact on the properties along the northwest quadrant and southeast quadrant. If CFI configuration is designed on Beechmont Avenue, the existing driveways on Beechmont Avenue for the gas station at the northwest quadrant and office building at the southeast quadrant will be eliminated. In addition, the CFI configuration on Beechmont Avenue eastbound approach will require a retaining wall structure. Based on previous experience, it is safe to presume that CFI configuration on all approaches will improve the traffic flow significantly (20-30 % in delay reduction). However, the analysis completed for the two-legged CFI shows significant improvements and the flow of traffic is within acceptable limits. It is not feasible to provide CFI configuration on Beechmont approaches at the because of significant impact on the adjacent property and substantial cost to provide a retaining wall structure. Should traffic demand increase in the future to the level that CFI configuration on Five Mile Road by itself, is inadequate to maintain acceptable flow of traffic through the intersection, it may be feasible to re-examine the intersection with four-legged CFI approaches.

Impact on Adjacent Properties

The intersection at present provides access to the abutting properties through driveways located adjacent to the intersection. The access locations on Beechmont Avenue in the vicinity of the intersection will not be impacted by the proposed modifications. However the two driveways on Five Mile Road along the east side, immediately north and south of the intersection will be impacted by the proposed improvements. The driveway to the north, if moved further north, can provide all the existing movements to and from the driveway. At the driveway on Five Mile Road south of the intersection, the left turns in and out of the driveway will be restricted. In order to maintain easy access for the businesses/properties at the southeast quadrant of the intersection, an access road should be built providing easy and safe access to the roadway network through the existing signalized intersection at Five Mile Road and Nimitzview

Drive. This task will require coordination between the owners of the property to establish the alignment for the access road that is acceptable to all parties involved.

The proposed improvements will also impact the driveway serving the existing bank located at the southwest quadrant of the intersection. At present, access to the bank is provided through a driveway connected to Fehl Lane running parallel to Five Mile Road and connected to Nimitzview Drive near the signalized intersection with Five Mile Road. The proposed modification at the intersection will require moving the existing driveway to the west, for maintaining adequate clearance between the driveway and the lane serving eastbound right turns at the intersection. Preliminary layout as shown in **Figure 2** indicates that the existing conditions in the area will allow moving the driveway to the Bank further west and maintaining traffic circulation for the Bank as it exists now.

Preliminary layout of the intersection also indicates some impact on the parking lot for the restaurant located at the northeast quadrant of the intersection. It may be required to relocate some of the parking spaces provided for this restaurant; however an accurate assessment of such an impact can be made during the detailed design using more accurate field survey data and topography. Also a retaining wall may minimize the impact on parking.

Right-of-Way

Preliminary layout for the intersection shows a need for additional right-of-way at the northeast and southwest quadrants of the intersection. Preliminary design indicates that the additional right-of-way requirement at the other two quadrants will be minimal, if any.

The assessment of additional right-of-way required is approximate. More accurate assessment will be made during the detailed study and design phase of the project.

Cost Estimate

Preliminary assessment of the proposed improvement indicates that the estimated cost for the design and construction of the proposed improvements at the intersection of Beechmont Avenue and Five Mile Road intersection, including the right-of-way will be approximately \$2.34 million. The estimated cost for the design, construction and the right-of-way for the proposed access road is approximately \$1.1 million (assuming about 1500 feet access road with 24 feet wide pavement).

CONCLUSIONS AND RECOMMENDATIONS

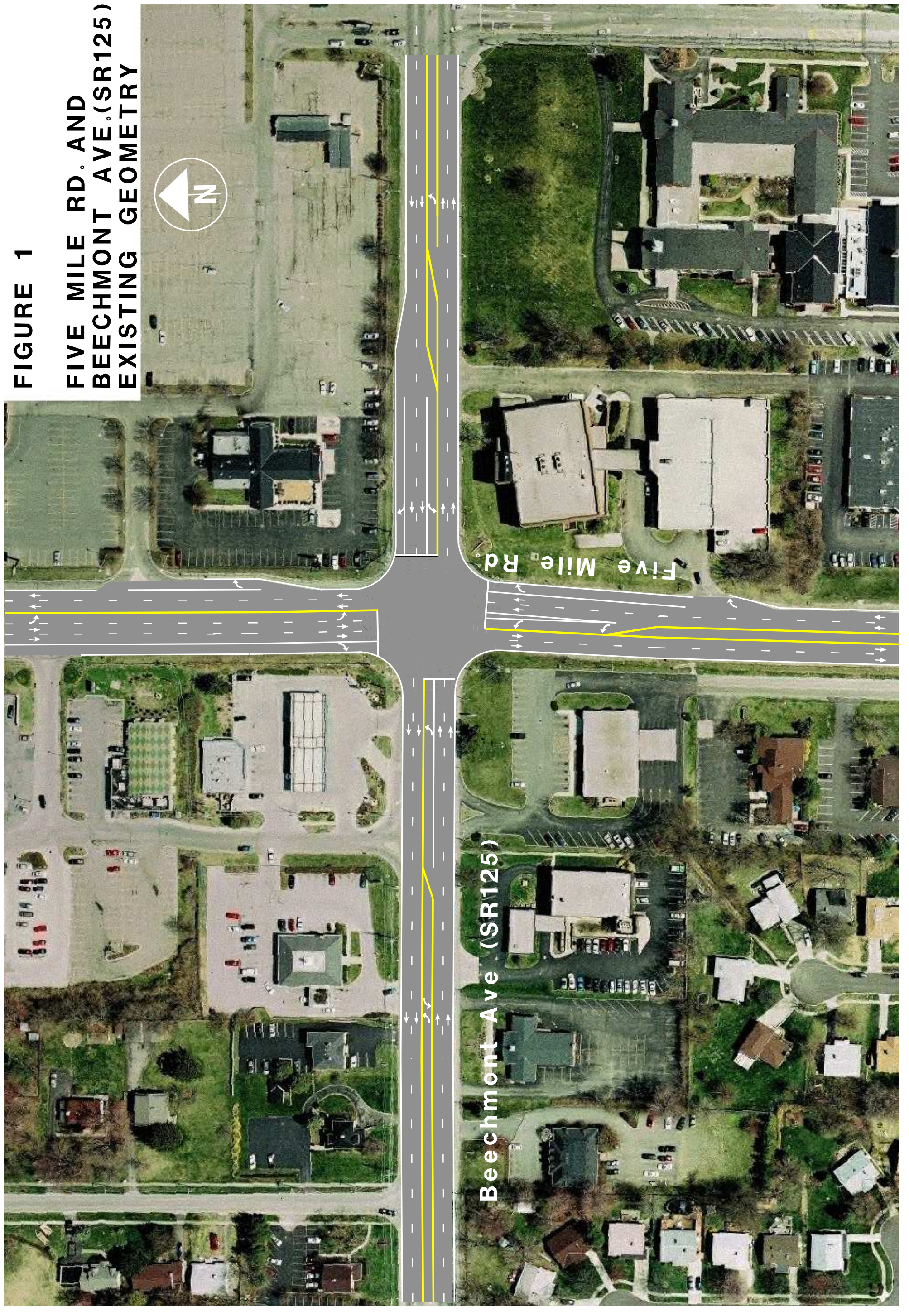
The analysis completed for the intersection shows a significant improvement in flow of traffic when analyzed with CFI configuration on the Five Mile Road approaches. Analysis with existing and year 2025 estimated traffic shows acceptable flow of traffic at the intersection. The accident records reviewed for the years 2002, 2003 and 2004 show a high number (42, 47, and 45) of accidents. With proposed improvements, some of the accidents, particularly involving left turns from Five Mile Road to Beechmont Avenue should be eliminated. Also, one of the reasons for high rear-end accidents is congested conditions. With improved traffic flow at the intersection under proposed conditions, the number of rear-end accidents will likely reduce.

Based on the results of the analysis completed, the following recommendations are presented:

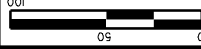
1. The detailed study and design for the proposed improvements at the intersection should be completed. The proposed design should be completed using accurate topography obtained by field survey and/or other means of data gathering that are used for design of roadways. The proposed design work should be accomplished with minimum impact on the adjacent properties required to maintain desirable flow of traffic.
2. All owners of the properties impacted by the improvements at the intersection should be approached and a task force should be formed to assist in providing an access road that connects the properties at the southeast quadrant of the intersection with the existing traffic signal at the intersection of Five Mile Road and Nimitzview Drive.
3. The driveway on Five Mile Road along the east side, north of the intersection should be relocated further north to serve all the businesses effectively.
4. The detailed design should evaluate the impact on the parking lot for the existing restaurant in the northeast quadrant and if required, appropriate mitigation such as relocation of the parking spaces and/or a retaining structure should be included as part of the proposed modifications.
5. During the design, coordination shall be maintained with ODOT in connection with the necessary permit review and also the in-house design in progress pertaining to the improvements on State Route 125 (Beechmont Avenue) in the vicinity of this intersection.

FIGURE 1

**FIVE MILE RD. AND
BEECHMONT AVE. (SR125)
EXISTING GEOMETRY**



HORIZONTAL
SCALE IN FEET

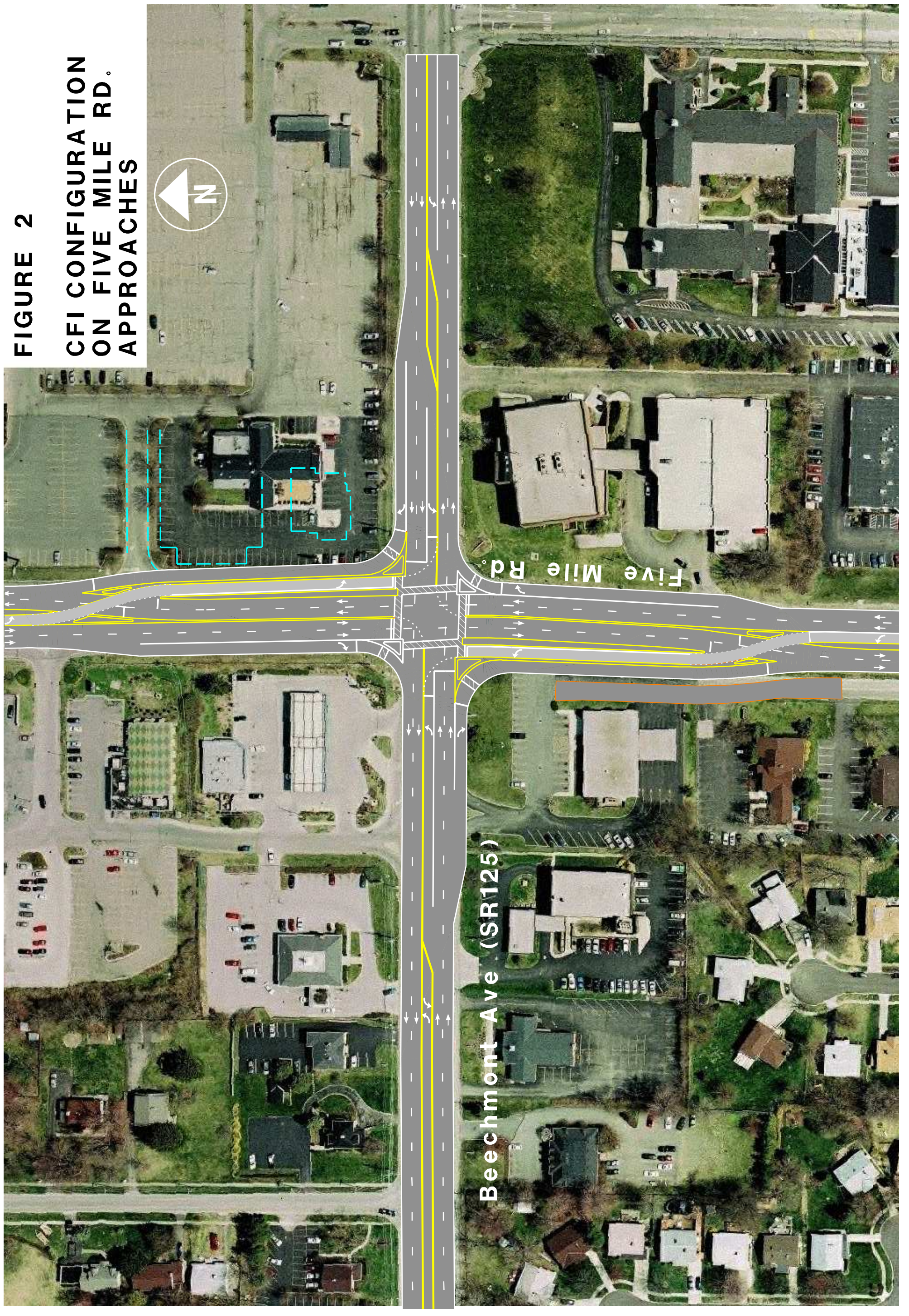


CALCULATED

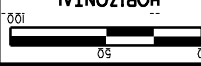
CHECKED



FIGURE 2
CFI CONFIGURATION
ON FIVE MILE RD.
APPROACHES



CALCULATED
CHECKED



HORIZONTAL
SCALE IN FEET

