



Foth Infrastructure & Environment, LLC
8191 Birchwood Court, Suite L
Johnston, IA 50131
(515) 254-1393 • Fax: (515) 254-1642
www.foth.com

February 24, 2015

TO: David Wilwerding, Community Development Director

CC:

FR: Molly Long, P.E.

RE: Birchwood Crossing Development and connection to NW 54th Avenue

Introduction

The City of Johnston requested an updated traffic impact study to analyze the traffic impact on NW 86th Street at Birchwood Court and NW 54th Avenue based on the proposed three additional buildings to the existing business park in Birchwood Crossing Development. The provision of an additional access route from Birchwood Court to NW 54th Avenue & Foxboro Road was also analyzed.

Project Description

The Birchwood Crossing Development is planning to construct an additional three buildings within the existing business park that would complete the original PUD submitted by Hubbell Realty Company in 1995. The three additional buildings would result in approximately 143,000 square feet of office / warehouse land use. The City of Johnston retained HR Green to conduct a traffic study of the Birchwood Crossing area in 2000 and again in 2004.

The 2000 study concluded that there was stress at that time at the intersection of Birchwood Court and NW 86th Street and that, “The provision of an additional access route from Birchwood Court to NW 54th Avenue near the proposed Building 6 would enhance traffic circulation for the site; however, provision of this connection can be deferred until construction of Building 6 without adversely affecting traffic operations on the adjacent street network.”

The 2004 study completed an updated review of the 2000 study and in summary, “The existing and proposed traffic at the intersection of NW 86th Street and Birchwood Court warrants the intersection improvements that have been planned to accommodate the peak hour operations. The improvements should be implemented as soon as possible. In addition, to improve circulation and provide a relief value to the NW 86th Street intersection, a connection between the east end of Birchwood Court and NW 54th Avenue and/or NW 72nd Street should be completed as part of the development of the remaining parcels. These projects provide separate but equally important improvements in the overall traffic flow on the NW 86th Corridor.”

Within this study, traffic operations in and around Birchwood Crossing Development (Figure 1) will be analyzed for optimum traffic circulation as well as maintaining the NW 86th Corridor integrity as it is a primary facility for traffic in and out of the City of Johnston. Traffic is analyzed for opening day conditions.

Three scenarios will be analyzed within the study;

1. Base Model (Existing)
 - Existing traffic distributions and assignment within the study area based upon traffic counts conducted
2. Additional Business Park with existing roadway network (Alternative 1)
 - Existing assignment with the addition of three office buildings
3. Additional Business Park with Birchwood Court extended to NW 54th Avenue & Foxboro Road (Alternative 2)
 - New traffic distribution and assignment within the study area to increase circulation of traffic.

These two traffic alternatives are used to determine if any of the proposed development traffic creates road capacity issues.

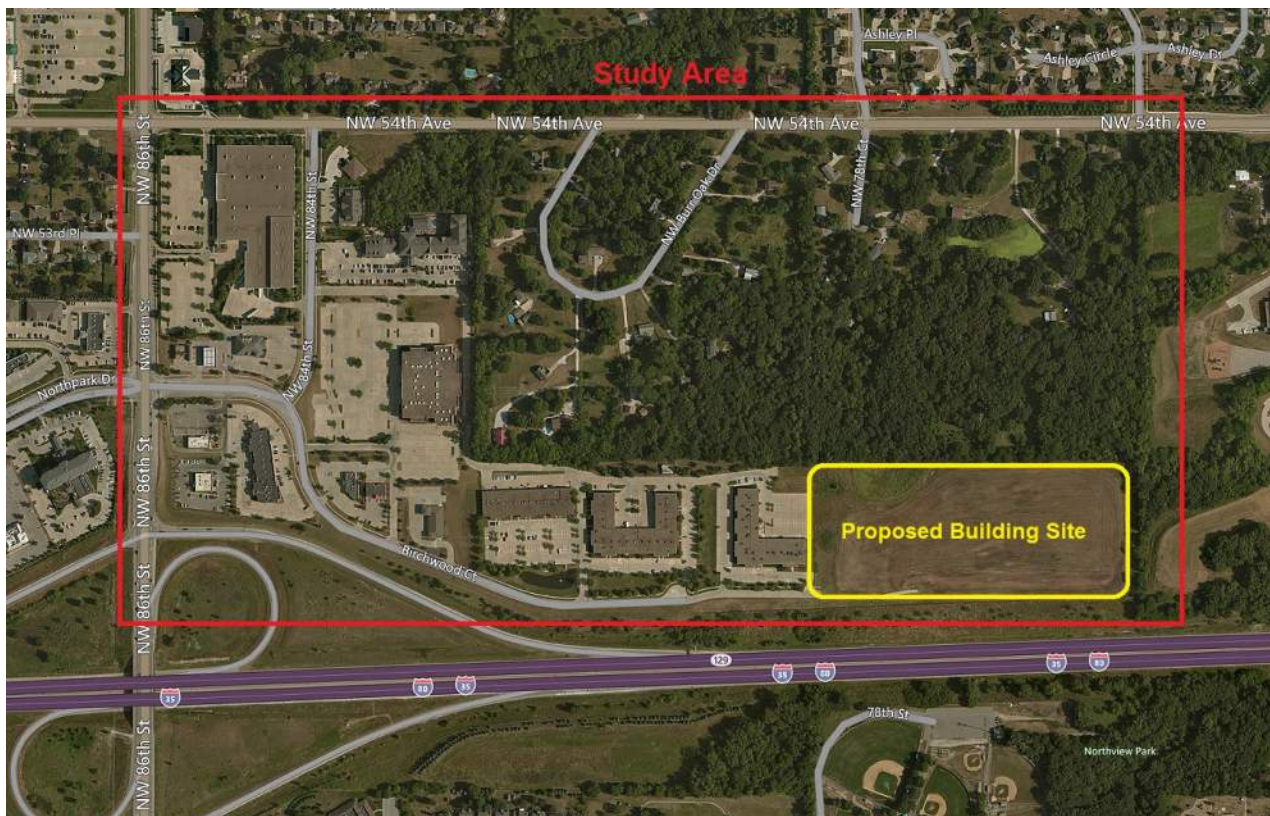


Figure 1. Birchwood Crossing Study Area

Existing Conditions

NW 86th Street is an urban four lane divided arterial roadway with dedicated left and right turns at Birchwood Court and dedicated left turns at NW 54th Avenue. NW 86th Street is classified as a minor arterial and serves as the only north-south corridor in the western half of Johnston with a connection to Interstate 80/35.

NW 54th Avenue is a two-lane rural cross section with ditches to the west of NW 86th Street and an urban two-lane cross section with curb and gutter to the east. It is classified as a collector. At the signalized intersection with NW 86th Street, NW 54th Avenue widens to accommodate eastbound and westbound right and left turn lanes. At the intersection with Foxboro Road, NW 54th Avenue accommodates an eastbound left turn lane and a westbound right turn lane. Southbound Foxboro is STOP controlled.

Birchwood Court is a two-lane urban cross section. It is classified as a collector. At the signalized intersection with NW 86th Street, Birchwood Court widens to accommodate westbound dual left turns and a shared thru-right.

Traffic

Traffic counts were conducted for the City of Johnston by Foth on NW 86th Street at the intersections of Birchwood Court and NW 54th Avenue in May of 2013. In January of 2015, Foth performed additional traffic counts at the intersection of NW 54th Avenue and Foxboro Road and on Birchwood Court just west of the first entrance to the office park. These counts will be used as the base traffic for the analysis for the proposed development. Full details of the counts can be found in the Appendix.

Trip Generation

A trip generation estimate was performed using the *Institute of Transportation Engineers (ITE) Trip Generation, 9th Edition*. The weekday AM and PM peak hour of the adjacent street trip generation rates were developed and shown in Table 1 and Figure 2. The trip generation shown in Table 1 includes calculated rates for the entire Study Area shown in Figure 1. Assumptions were made for the entering and existing trip percentages for the Business Park based on existing counts.

Table 1. Summary of Trip Generation

Node	ITE Category	Use	Unit	Quantity	AM Peak Hour Trips			PM Peak Hour Trips		
					Total	Entering	Exiting	Total	Entering	Exiting
7	Village Inn	High-Turnover Restaurant	1,000 Sq Ft	4.25	50	28	23	40	24	16
						56%	46%		60%	40%
8	Burger King	Fast Food w/ Drive-Thru	1,000 Sq Ft	3.60	170	87	83	120	62	58
						51%	49%		52%	48%
9	Strip Mall	Special Retail Center	1,000 Sq Ft	25.00	0	0	0	70	31	39
						0%	0%		44%	56%
10	Kum & Go	Convenience Market w/ Gas Pumps	Pumps	12.00	200	100	100	230	115	115
						50%	50%		50%	51%
11	Okaboji Grill	High-Turnover Restaurant	1,000 Sq Ft	8.60	0	0	0	80	48	32
						0%	0%		60%	51%
12	Empty Warehouse	Empty	1,000 Sq Ft	168.00	0	0	0	0	0	0
						0%	0%		0%	0%
13	Dental Office	Medical Office Building	1,000 Sq Ft	4.90	20	16	4	10	3	7
						80%	20%		30%	70%
14	Stoney Creek Inn	Hotel	Rooms	165.00	90	53	37	100	51	49
						59%	41%		51%	49%
15	Wynnsong	Movie Theater	1,000 Sq Ft	63.25	0	0	0	240	154	86
						0%	0%		47%	36%
16	Cozy Café	High-Turnover Restaurant	1,000 Sq Ft	4.20	50	28	23	40	24	16
						56%	46%		60%	40%
17	Car Wash	Automated Car Wash	Stalls	4.00	10	7	3	60	30	30
						70%	30%		50%	50%
18	Hill Top Auto	Auto Care Center	1,000 Sq Ft	7.50	20	13	7	20	10	10
						31%	69%		50%	50%
21	Existing Business Park	Business Park	Acres	13.50	260	221	39	230	16	214
						85%	15%		7%	93%
22	Proposed Business Park	Business Park	Acres	13.50	260	221	39	230	16	214
						85%	15%		7%	93%
25	Single Family	Single Family Detached Housing	Dwelling Units	16.00	20	5	15	20	13	7
						25%	75%		65%	35%
Existing Trips					870	553	319	1240	568	672
Proposed Additional Trips					280	226	54	250	29	221
Total Potential Trips					1150	779	373	1490	597	893



Figure 2. Study Area with Land Use Area Nodes

Trip Distribution and Assignment

The distributions of the existing generated trips of the study area were assigned to match the existing turning movements from traffic counts conducted and can be found in Figure 3. Figure 4 shows the additional trips assigned to the existing network with the addition of the proposed business park, Alternative 1. Existing traffic turning movement percentages were used to assign the additional office building traffic to the existing road network. Figure 5 shows the redistributed volumes for Alternative 2, the connection of Birchwood Court to NW 54th Avenue.

Within Scenario 3, it was assumed that traffic generated from the existing and proposed business park was assigned to the access locations as follows:

Existing Business Park

AM Peak Hour

NW 86 th St/Birchwood:	70% entering, 55% exiting
NW 86 th St/NW 54 th Ave (via Stoney Creek):	20% entering, 20% exiting
NW 86 th St/NW 54 th Ave (via Foxboro Rd):	10% entering, 25% exiting

PM Peak Hour

NW 86 th St/Birchwood:	60% entering, 55% exiting
NW 86 th St/NW 54 th Ave (via Stoney Creek):	25% entering, 20% exiting
NW 86 th St/NW 54 th Ave (via Foxboro Rd):	15% entering, 25% exiting

Proposed Business Park

AM Peak Hour

NW 86 th St/Birchwood:	70% entering, 35% exiting
NW 86 th St/NW 54 th Ave (via Stoney Creek):	10% entering, 20% exiting
NW 86 th St/NW 54 th Ave (via Foxboro Rd):	20% entering, 45% exiting

PM Peak Hour

NW 86 th St/Birchwood:	60% entering, 40% exiting
NW 86 th St/NW 54 th Ave (via Stoney Creek):	15% entering, 20% exiting
NW 86 th St/NW 54 th Ave (via Foxboro Rd):	25% entering, 40% exiting

Operational Analysis

This section includes the analysis for the intersections of NW 86th Street with Birchwood Court and NW 54th Avenue, and the intersection of NW 54th Avenue with Foxboro Road. The operational analysis will include performance measures at these locations for the three scenarios listed. Performance measures used to assess the system operations include delay, volume to capacity ratio, operations of adjacent intersections, maximum queue/storage lengths, and control delay.

Analysis

AM and PM peak hour traffic analysis were performed with opening day traffic for all three scenarios. All intersection capacity analyses were evaluated in *Vistro, Version 3.00-04*, which uses the *Highway Capacity Manual 2010* (HCM) methods.

To analyze intersection operations, vehicular delay is equated to Level of Service (LOS) criteria with an A through F scale. LOS A is the most desirable, with the least delay, while LOS F is the least desirable, where excessive delay is experienced. A summary of LOS, as defined by the

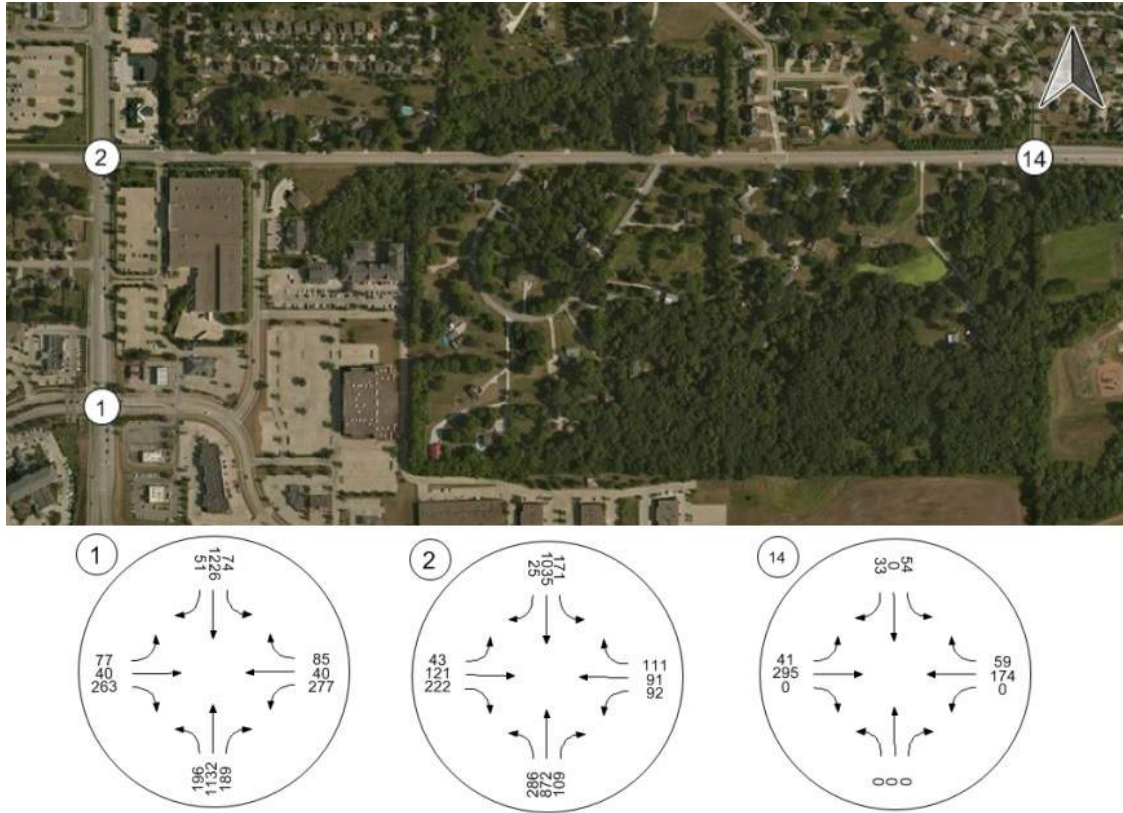


Figure 3. Existing PM Peak Turning Movements

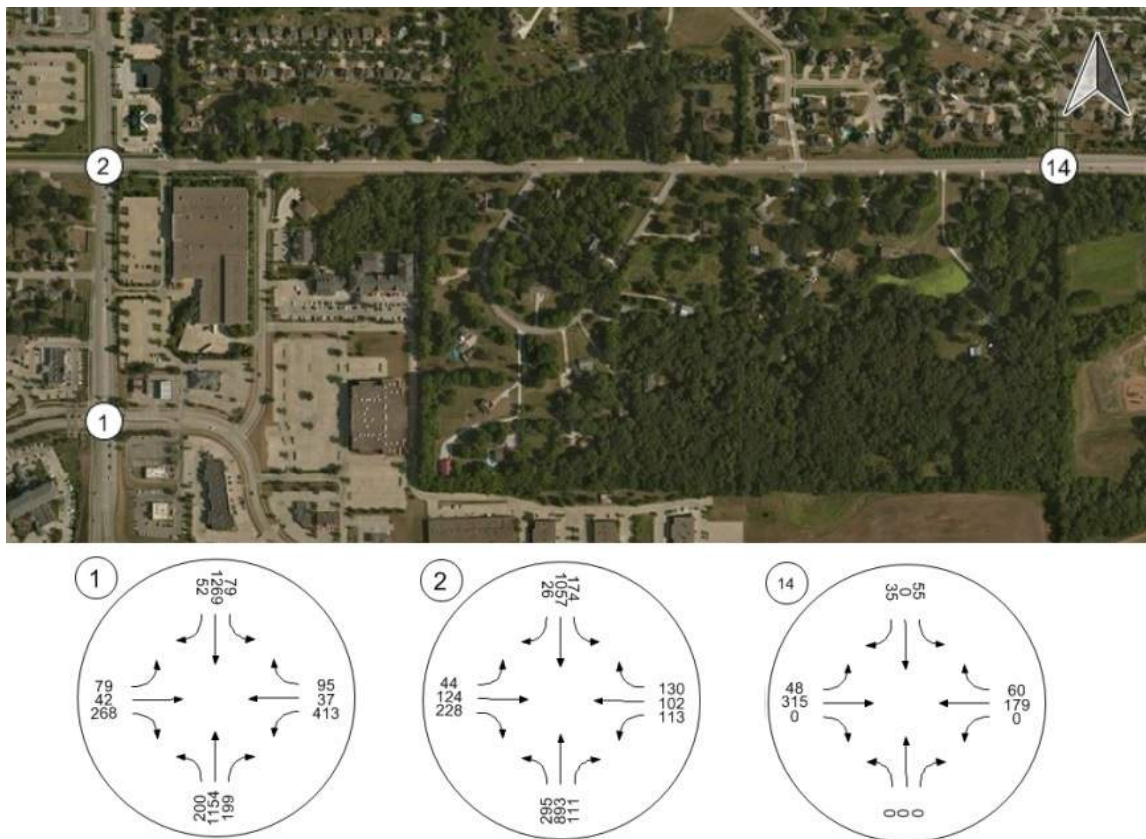


Figure 4. Alternative 1 PM Peak Turning Movements

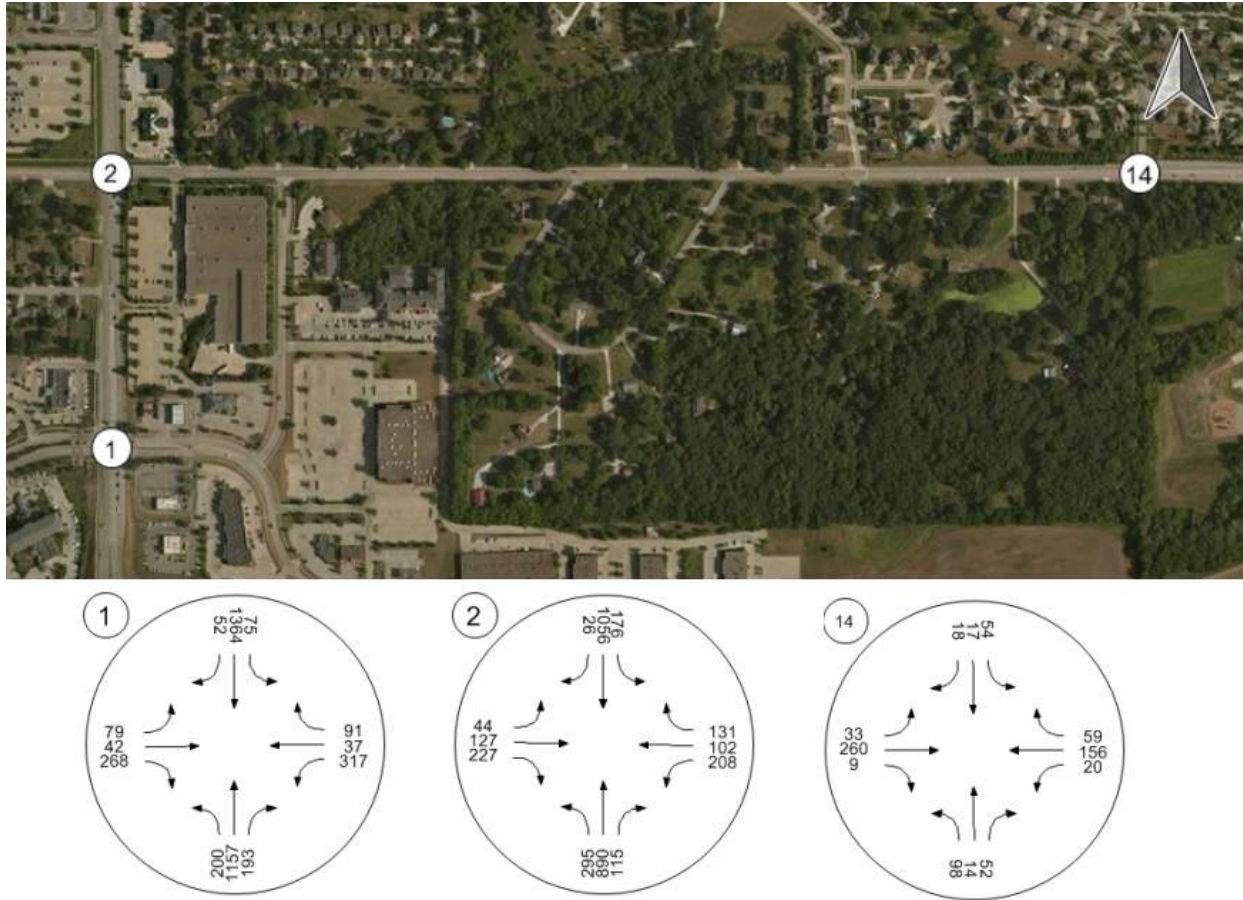


Figure 5. Alternative 2 PM Peak Turning Movements

HCM, is shown in Table 2. For the Des Moines Metropolitan area, typically LOS D is the minimum acceptable LOS for signalized intersections and approaches.

Table 2. Level of Service (LOS) Definition

LOS	Average Delay per Vehicle (sec)	
	Signalized Intersections	Unsignalized Intersections
A	Less than 10	Less than 10
B	10 to 20	10 to 15
C	20 to 35	15 to 25
D	35 to 55	25 to 35
E	55 to 80	35 to 50
F	Greater than 80	Greater than 50

The results from the three scenarios are shown in Table 3. The output from the Vistro models can be found in the Appendix. As site generated traffic was added to the existing conditions, traffic signal timings remained constant to maintain the NW 86th corridor coordination.

Table 3. LOS Summary

			Existing	Alternative 1 No Connection @54th	Alternative 2 Connection @54th
NW 86th Street & Birchwood Court	Critical Movement	AM	NBL - C (31) SBL - C (31) EBL - C (34) WBTR - C (28)	NBL - D (45) SBL - D (50) EBL - D (53) WBTR - E (57)	NBL - D (45) SBL - D (42) EBL - D (44) WBTR - D (39)
	Intersection	AM	B (19)	D (38)	C (23)
	Critical Movement	PM	NBL - D (48) SBL - D (49) EBR - D (54) WBL - D (49)	NBL - D (52) SBL - D (50) EBR - F (93) WBL - F (292)	NBL - D (52) SBL - D (50) EBR - F (93) WBL - F (131)
	Intersection	PM	C (25)	E (61)	D (42)
NW 86th Street & NW 54th Avenue	Critical Movement	AM	NB - B (17) SB - C (21) EB - C (25) WB - C (22)	NB - C (21) SB - C (26) EB - D (36) WB - C (29)	NB - C (21) SB - C (27) EB - D (37) WB - C (29)
	Intersection	AM	B (17)	C (22)	C (23)
	Critical Movement	PM	NB - B (15) SB - C (21) EB - C (29) WB - C (26)	NBL - C (31) SB - C (33) EB - D (43) WB - C (35)	NBL - C (34) SB - D (37) EB - D (46) WB - D (35)
	Intersection	PM	B (17)	C (27)	C (29)
NW 54th Avenue & Foxboro Road	Unsignalized	AM	SB - B (15) EBL - A (1) WB - A (0)	SB - B (12) EBL - A (1) WB - A (0)	NBL - B (15) SBL - B (21) EBL - A (2) WBL - A (1)
	Unsignalized	PM	SB - B (13) EBL - A (2) WB - A (0)	SB - B (16) EBL - A (3) WB - A (0)	NBL - C (18) SBL - C (16) EBL - A (2) WBL - A (1)

The peak hour operational analysis shows that without a Birchwood Court connection to NW 54th Avenue that the intersection of NW 86th Street & Birchwood Court falls to a LOS E from the existing LOS C in the PM peak hour and from a LOS B to a LOS D in the AM peak hour.

Intersection Operations

The operations of the intersection of NW 86th Street & Birchwood Court saw a significant change from the site proposed plan additions. The operations of the intersection of NW 86th Street & NW 54th Avenue saw little change from the proposed site plan additions.

Conclusions

The addition of three new office buildings to the existing Birchwood Crossing site has the following impacts on the surrounding area and road network.

1. An additional 280 trips will be generated in the AM peak hour and an additional 250 trips will be generated in the PM peak hour within the study area.
2. Without the connection of Birchwood Court to NW 54th Avenue, the intersection of NW 86th Street & Birchwood Court decreases LOS in the AM peak hour from B to D and from LOS C to E in the PM peak hour.
3. With the connection of Birchwood Court to NW 54th Avenue, the intersection of NW 86th Street & Birchwood Court decreases LOS in the AM peak hour from B to C and from LOS C to D in the PM peak hour.
4. If the connection of Birchwood Court to NW 54th Avenue is approved, the intersection of Foxboro Road & NW 54th Avenue does not meet any signal warrants.

Recommendations

Based on the information provided by this report, the following improvements are recommended.

- Extend Birchwood Court to NW 54th Avenue and Foxboro Road. With this connection, traffic circulation within the study will allow the intersection of NW 86th Street & Birchwood Court to function at an acceptable LOS.
- Align the extension on Birchwood Court to NW 54th Avenue with Foxboro Road. The traffic circulation shown within this study is centered upon of this alignment. Offset intersections introduce extra turning movements which increases the potential for rear end collisions and is confusing for drivers.