Intersection Spacing Variance

Presented at Planning & Zoning Commission

March 23, 2023

November 11, 2022

City of Fort Collins – Traffic Engineering
626 Linden St
Fort Collins, CO 80524

Re: Ziegler- Corbett –Intersection Spacing Variance

Dear Staff:

This variance letter pertains to the intersection spacing of the proposed Ziegler-Corbett access and the existing unsignalized Paddington Road/Grand Teton Place intersection along Ziegler Road.

According to Table 7-3 Fort Collins (GMA and City Limits) Street Standards – Technical Design Criteria in the **Larimer County Urban Area Street Standards** (LCUASS), on four lane arterials, the distance between unsignalized intersections is a minimum of 460'. The estimated traffic generated from the Ziegler-Corbett onto Ziegler Road will meet the peak hour signal warrant with the proposed intersection aligned with the existing Hidden Pond Drive intersection. The existing intersection spacing between Hidden Pond Drive and Paddington Road/Grand Teton Place is approximately 430'. According to Section 8.2.2 Lane Alignment in LCUASS, lanes shall align through an intersection. This along with the signalization warrant, is requiring the variance of standard from the minimum intersection spacing.

The traffic memorandum "Ziegler-Corbett Traffic Analyses Related to Inclusion of the Young Property", prepared by Delich Associates, dated September 15, 2022, analyzed Ziegler Road access scenarios and is referenced as part of this variance request. Scenario 2 is the analyses of a signalized access onto Ziegler Road, aligned with the existing Hidden Pond Road. In this report it is stated:

If the Scenario 2 intersection is implemented, the peak hour signal warrant will be met. It is acknowledged that the Ziegler/Paddington-Grand Teton intersection is approximately 430 feet to the north (does not meet intersection spacing criterion). Therefore, a variance will be required due to this. Based upon the operations analyses, the 95th percentile left-turn queues (northbound to Paddington Road and southbound to Hidden Pond Drive) will not conflict. The respective queues are not more than 25 feet. This segment can be striped as a continuous two-way left-turn lane. With a signal at the Ziegler/Site Access-Hidden Pond intersection, it is expected that gaps to the north/south through traffic on Ziegler Road will occur, which will improve the minor leg operation at the stop sign controlled Ziegler/Paddington-Grand Teton intersection.

Therefore, it is requested that the reduction from the standard minimum 460' intersection spacing to the existing 430' separation be considered.

This variance will not be detrimental to the public health, welfare, and safety. This variance will have no impact on the capital and maintenance costs of the City of Fort Collins. It is respectfully requested this variance be granted.

Sincerely,
Highland Development Services

COLORADO LICENSED JASON THOMAS CLAEYS 11/11/22 PROFESSIONAL ENGINEER

Jason T. Claeys, P.E., LEED AP
Sr. Project Manager
Enclosure

DELICH ASSOCIATES Traffic & Transportation Engineering
2272 Glen Haven Drive Loveland, Colorado 80538
Phone: (970) 669-2061 Fax: (970) 669-5034

MEMORANDUM

TO: Jason Sherill, Landmark Homes
Mike Walker, TB Group
Jason Claeys, Highland Development Services
Nicole Hahn, Fort Collins Traffic Operations
Ryan Mounce, Fort Collins Planning

FROM: Matt Delich

DATE: September 15, 2022

SUBJECT: Ziegler-Corbett Traffic Analyses Related to Inclusion of the Young Property
(File: 2166ME01)

This memorandum provides traffic analyses related to the inclusion of the Young Property in the Ziegler-Corbett Mixed-Use ODP. The **Ziegler-Corbett Mixed-Use ODP Master Transportation Impact Study** (TIS), dated January 2022, was utilized in the following analyses. As discussed in a meeting with City staff on August 4, 2022, two access scenarios were analyzed. Scenario 1 – The proposed channelized-T intersection would continue to be the primary access to the Ziegler-Corbett Mixed-Use development. Scenarios 2 – The access to the Ziegler-Corbett Mixed-Use development would be moved to the Young Property, lining up with Hidden Pond Drive on the east side of Ziegler Road. In both scenarios, all other intersections would remain as analyzed in the TIS, with no vehicular access from the Ziegler-Corbett Mixed-Use development to Paddington Road. The following analyses were conducted: trip generation, trip assignment, level of service operations, and signal warrants.

The location of the Young Property is shown on the site plan from the TIS (outlined in red) in Appendix A. The Young Property will be part of Area D. The land uses on the Young Property, as analyzed, are 20,000 square feet of retail and 20,000 square feet of general office. The trip generation table from the TIS is provided in Appendix A showing the additional trips from the Young Property. The peak hour trip generation for these additional uses were assigned to the site generated traffic as shown in Figure 1. The long range (2040) total peak hour traffic is shown in Figure 2. The alternative full-movement Ziegler/Site Access-Hidden Pond intersection (Scenario 2) is also shown in Figure 2.

The intersection level of service (LOS) was analyzed for both scenarios. Table 1 shows the peak hour operation at the Ziegler/Site Access intersection (channelized-T intersection). Calculation forms are provided in Appendix B. The calculated delay for the minor street left turns will be similar to that at the channelized-T intersection (slightly higher with the additional traffic due to the Young Property). The City of Fort Collins accepts that LOS F will occur at stop sign controlled intersections along arterial streets.

Table 2 shows the peak hour operation at the Ziegler/Site Access-Hidden Pond intersection (Scenarios 2 [4-leg intersection]). Calculation forms are provided in Appendix C. The calculated

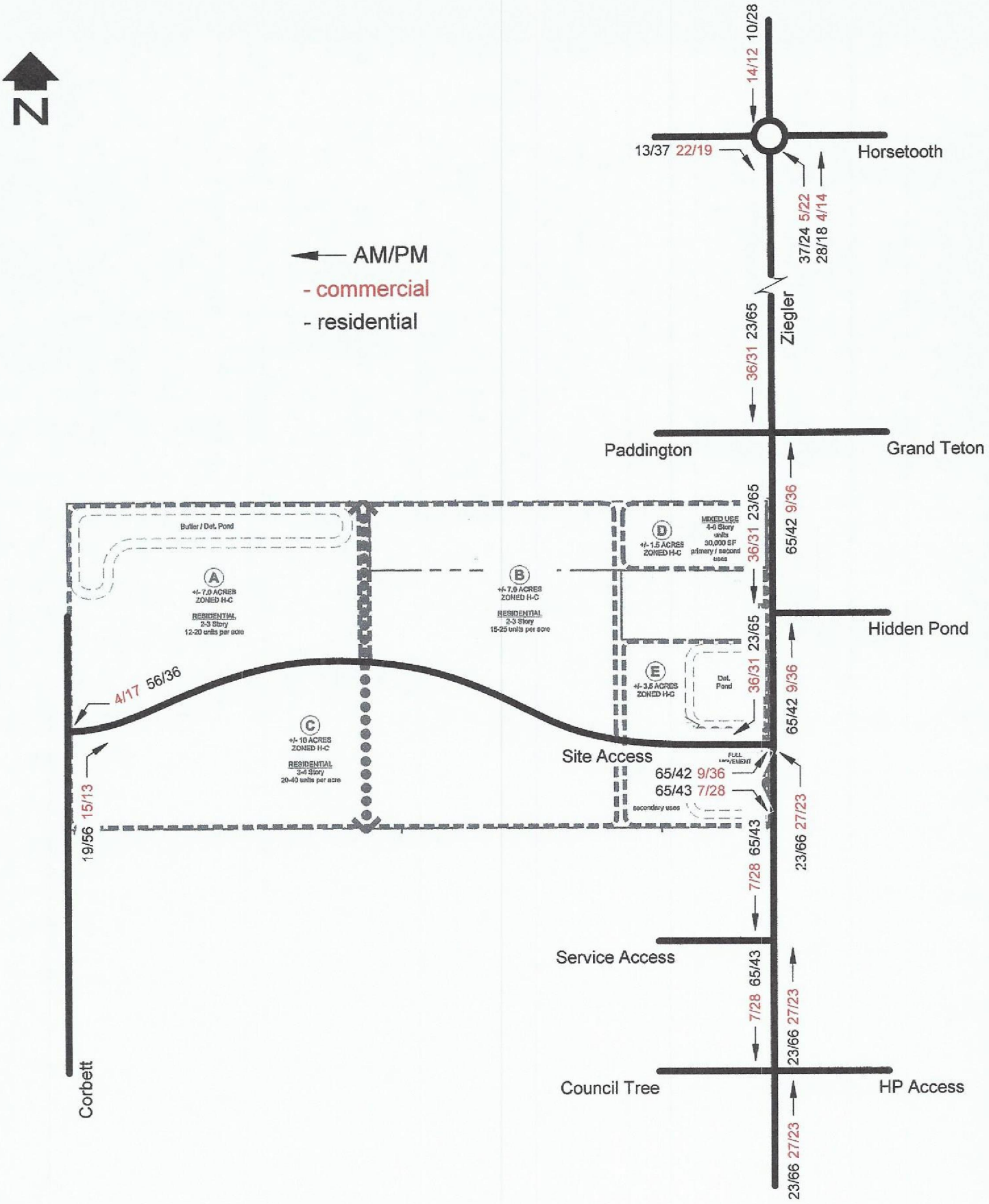
delay for the minor street left turns and the legs will be significant. As expected, the delays will be higher than those at the channelized-T intersection. These significant delays will have a bearing on the following signal warrant analyses.

Under Scenario 1 (channelized-T intersection) the volume warrant will not be met (Warrant 3/Peak Hour/Category A). At the channelized-T intersection, the delay to the minor street left turns is considerably less than that at a conventional 4-leg intersection. This is due to the ability to execute the minor street left turns in a two-step maneuver.

However, under Scenario 2, the delay to the minor street left turns is more significant. Under Warrant 3/Peak Hour/Category A: the total calculated stopped delay will be greater than 4 vehicle-hours, the minor street approach volume will be greater than 150 vehicles, and the total entering volume at the intersection will be greater than 800 vehicles. Therefore, the peak hour signal warrant will be met if the Ziegler-Corbett Site Access lines up with Hidden Pond Drive.

If the Scenario 2 intersection is implemented, the peak hour signal warrant will be met. It is acknowledged that the Ziegler/Paddington-Grand Teton intersection is approximately 430 feet to the north (does not meet intersection spacing criterion). Therefore, a variance will be required due to this. Based upon the operations analyses, the 95th percentile left-turn queues (northbound to Paddington Road and southbound to Hidden Pond Drive) will not conflict. The respective queues are not more than 25 feet. This segment can be striped as a continuous two-way left-turn lane. With a signal at the Ziegler/Site Access-Hidden Pond intersection, it is expected that gaps to the north/south through traffic on Ziegler Road will occur, which will improve the minor leg operation at the stop sign controlled Ziegler/Paddington-Grand Teton intersection.

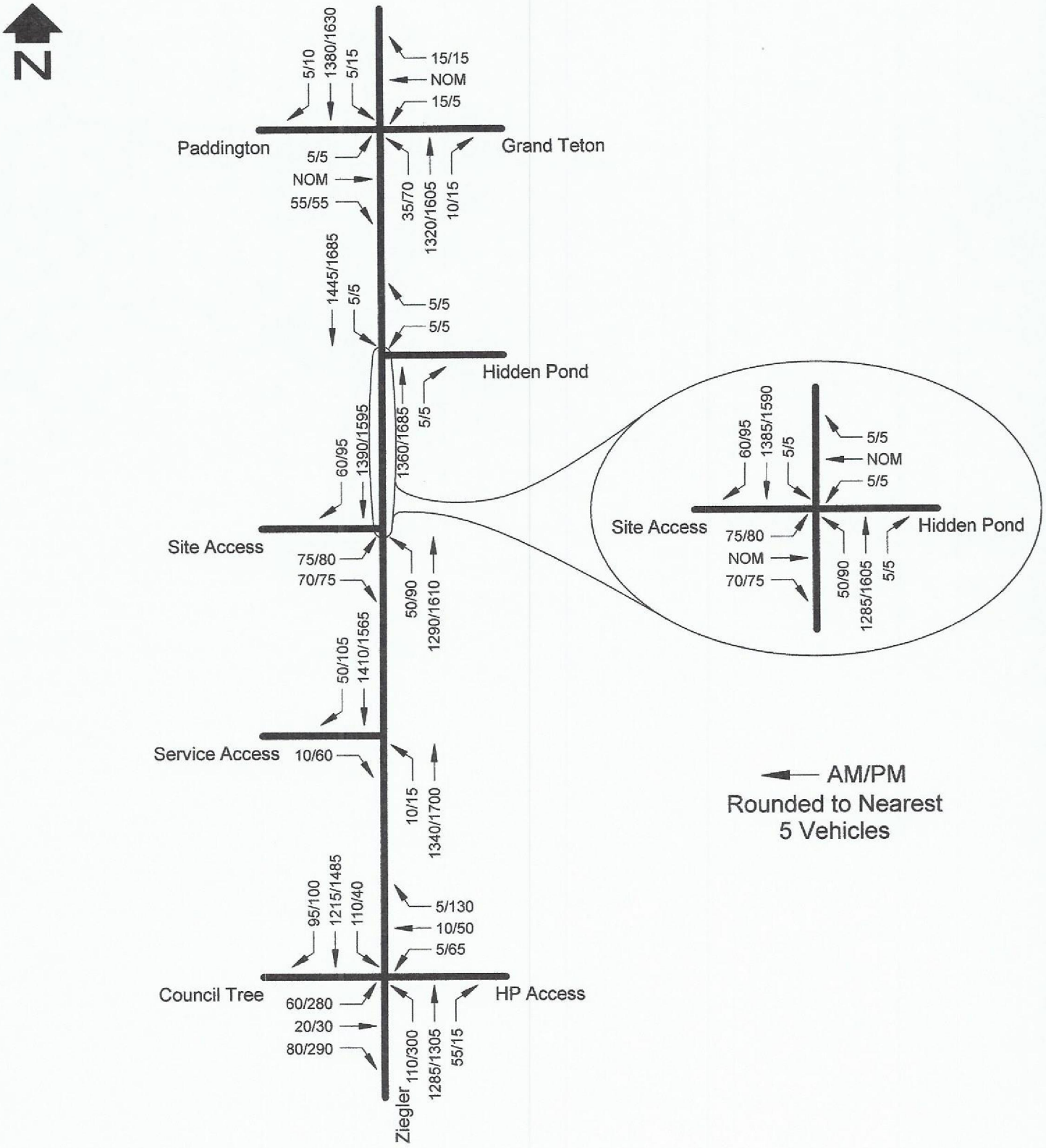
The foregoing analyses indicate that moving the Ziegler-Corbett Site Access to line up with Hidden Pond Drive will meet the peak hour signal warrant. It is suggested that consideration be given to implementing Scenario 2. This should be discussed further with the City of Fort Collins staff. Do not hesitate to contact me if there are questions or if additional information is required.



SITE GENERATED PEAK HOUR TRAFFIC WITH THE YOUNG PROPERTY

Figure 1

DELICH ASSOCIATES



LONG RANGE (2040) TOTAL PEAK HOUR TRAFFIC WITH THE YOUNG PROPERTY

Figure 2

DELICH ASSOCIATES

TABLE 1

Long Range (2040) Peak Hour Operation at the Ziegler/Site Access Intersection

Intersection	Movement	Level of Service	
		AM	PM
Ziegler/Site Access (stop sign) [channelized-T two step left turn]	EB LT	F (60 secs)	F (165 secs)
	EB RT	C	C
	EB APPROACH	E (39 secs)	F (95 secs)
	NB LT	B	C
	OVERALL	A	A

TABLE 2

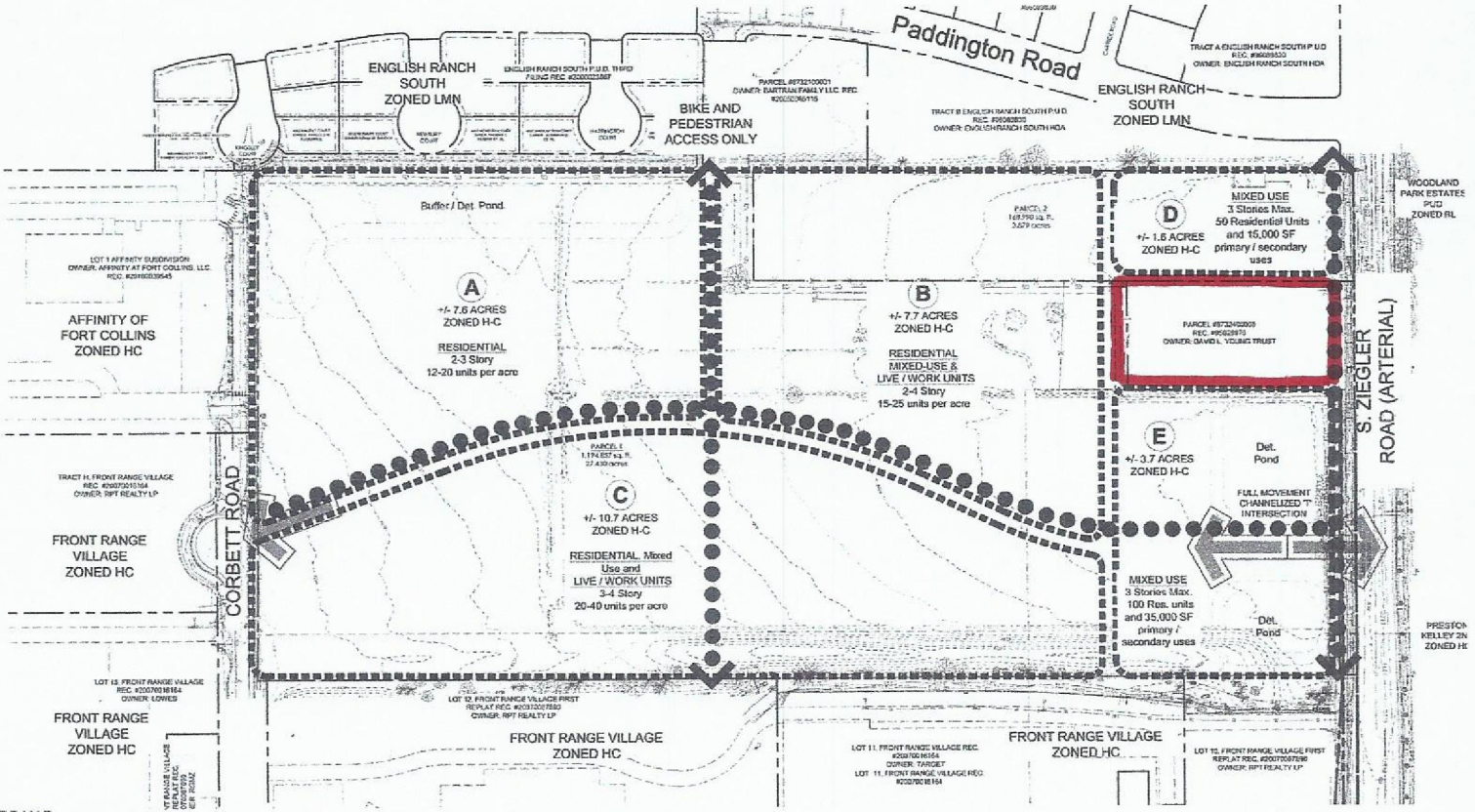
Long Range (2040) Peak Hour Operation at the Ziegler/Site Access-Hidden Pond Intersection

Intersection	Movement	Level of Service	
		AM	PM
Ziegler/Site Access-Hidden Pond (stop sign)	EB LT/T	F (1720 secs)	F (5192 secs)
	EB RT	C	C
	EB APPROACH	F (898 secs)	F (2690 secs)
	WB LT/T/RT	F (153 secs)	F (623 secs)
	NB LT	B	C
	SB LT	B	B
	OVERALL	E (45 secs)	F (120 secs)

APPENDIX A

N

SCALE: 1"=300'



ODP MAP

Legend

PROPERTY BOUNDARY / ROW

DEVELOPMENT PARCEL BUBBLES (FOR GRAPHICAL PURPOSES ONLY)

PEDESTRIAN / BIKE ROUTE AND ASSOCIATED IMPROVEMENTS

POTENTIAL VEHICULAR & BIKE / PED ACCESS POINT

Parcel Index

PARCEL	ZONING	ACREAGE	ANTICIPATED USES
PARCEL A	HC	+/- 7.6 AC	SECONDARY / RESIDENTIAL USES
PARCEL B	HC	+/- 7.7 AC	SECONDARY / RESIDENTIAL USES / MIXED USE
PARCEL C	HC	+/- 10.7 AC	SECONDARY / RESIDENTIAL USES / MIXED USE
PARCEL D	HC	+/- 1.6 AC	PRIMARY AND SECONDARY - MIXED USE
PARCEL E	HC	+/- 3.7 AC	PRIMARY AND SECONDARY - MIXED USE

Land-Use Statistics

ZONE DISTRICT TYPE	GROSS ACREAGE	RESIDENTIAL DENSITY	ESTIMATED UNITS	MAX. BLDG HT	HOUSING TYPE	COMMER
PARCEL A	+/- 7.6 AC	12 - 20 DU / AC	84 - 140	2 & 3 STORIES	SFA / MF	---
PARCEL B	+/- 7.7 AC	15 - 25 DU / AC	105 - 175	2-4 STORIES	SFA / MF / MIXED-USE	+/- 2,500
PARCEL C	+/- 10.7 AC	20 - 40 DU / AC	200 - 400	3-4 STORIES	SFA / MF / MIXED-USE	+/- 2,500
PARCEL D	+/- 1.6 AC	0 - 30.06 AC	50 MAX	3 STORIES MAX	MIXED - USE	+/- 15,000
PARCEL E	+/- 3.7 AC	0 - 17.00 AC	100 MAX	3 STORIES MAX	MIXED - USE	+/- 35,000
TOTAL	+/- 31.3 AC	0 DU - 40.0 DU	400 MIN - 700 MAX (OVERALL)			+/- 80,000

0 100 150 200

SITE PLAN

Figure 5

DELICH ASSOCIATES

TABLE 2
Trip Generation

Code	Use	Size	AWDTE		AM Peak Hour				PM Peak Hour			
			Rate	Trips	Rate	In	Rate	Out	Rate	In	Rate	Out
Area A												
221	Mid-Rise Apartment	110 D.U.	5.44	598	0.09	10	0.27	29	0.27	29	0.17	19
Area B												
221	Mid-Rise Apartment	140 D.U.	5.44	762	0.09	13	0.27	37	0.27	38	0.17	24
Area C												
221	Mid-Rise Apartment	300 D.U.	5.44	1632	0.09	28	0.27	80	0.27	80	0.17	52
Area D												
221	Mid-Rise Apartment	50 D.U.	5.44	272	0.09	5	0.27	13	0.27	13	0.17	9
710	Office	15.0 KSF	9.74	146	1.00	15	0.16	2	0.18	3	0.97	14
820	Young Property - Retail	20.0 KSF	37.75	756	0.58	12	0.36	7	1.83	37	1.98	4
710	Young Property - Office	20.0 KSF	9.74	194	1.00	20	0.16	3	0.18	4	0.97	19
Subtotal				1368		52		25		57		46
Area E												
221	Mid-Rise Apartment	100 D.U.	5.44	544	0.09	9	0.27	27	0.27	27	0.17	17
710	Office	25.0 KSF	9.74	244	1.00	25	0.16	4	0.18	5	0.97	24
820	Retail	10.0 KSF	37.75	378	0.58	6	0.36	4	1.83	18	1.98	20
Subtotal				1166		40		35		50		61
Total				**5,526**		**143**		**206**		**254**		**202**

APPENDIX B

Intersection

Int Delay, s/veh	2.2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	75	70	50	1290	1390	60
Future Vol, veh/h	75	70	50	1290	1390	60
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	100	0	130	-	-	100
Veh in Median Storage, #	2	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	79	74	53	1358	1463	63

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	2248	732	1526	0	-	0
Stage 1	1463	-	-	-	-	-
Stage 2	785	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	~ 35	364	433	-	-	-
Stage 1	179	-	-	-	-	-
Stage 2	410	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	~ 31	364	433	-	-	-
Mov Cap-2 Maneuver	140	-	-	-	-	-
Stage 1	157	-	-	-	-	-
Stage 2	410	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	39.3	0.5	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	433	-	140	364	-	-
HCM Lane V/C Ratio	0.122	-	0.564	0.202	-	-
HCM Control Delay (s)	14.5	-	59.7	17.4	-	-
HCM Lane LOS	B	-	F	C	-	-
HCM 95th %tile Q(veh)	0.4	-	2.8	0.7	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection						
Int Delay, s/veh	4.6					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	80	75	90	1610	1595	95
Future Vol, veh/h	80	75	90	1610	1595	95
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	100	0	130	-	-	100
Veh in Median Storage, #	2	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	84	79	95	1695	1679	100

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	2717	840	1779	0	-	0
Stage 1	1679	-	-	-	-	-
Stage 2	1038	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	~ 17	309	345	-	-	-
Stage 1	137	-	-	-	-	-
Stage 2	302	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	~ 12	309	345	-	-	-
Mov Cap-2 Maneuver	89	-	-	-	-	-
Stage 1	99	-	-	-	-	-
Stage 2	302	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	95.2	1	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	345	-	89	309	-	-
HCM Lane V/C Ratio	0.275	-	0.946	0.255	-	-
HCM Control Delay (s)	19.3	-	165.1	20.6	-	-
HCM Lane LOS	C	-	F	C	-	-
HCM 95th %tile Q(veh)	1.1	-	5.3	1	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

APPENDIX C

Intersection

Int Delay, s/veh	45											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	75	0	70	5	0	5	50	1285	5	5	1385	60
Future Vol, veh/h	75	0	70	5	0	5	50	1285	5	5	1385	60
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	100	-	-	-	100	-	-	100	-	250
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	79	0	74	5	0	5	53	1353	5	5	1458	63

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2251	2932	729	2201	2993	679	1521	0	0	1358	0	0
Stage 1	1468	1468	-	1462	1462	-	-	-	-	-	-	-
Stage 2	783	1464	-	739	1531	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	~ 23	15	365	25	14	394	435	-	-	502	-	-
Stage 1	134	190	-	135	192	-	-	-	-	-	-	-
Stage 2	353	191	-	375	177	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	~ 20	13	365	18	12	394	435	-	-	502	-	-
Mov Cap-2 Maneuver	~ 20	13	-	18	12	-	-	-	-	-	-	-
Stage 1	118	188	-	119	169	-	-	-	-	-	-	-
Stage 2	306	168	-	296	175	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s$	897.9	152.7	0.5	0
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	435	-	-	20	365	34	502	-	-
HCM Lane V/C Ratio	0.121	-	-	3.947	0.202	0.31	0.01	-	-
HCM Control Delay (s)	14.4	-	-	$ 1719.7	17.3	152.7	12.2	-	-
HCM Lane LOS	B	-	-	F	C	F	B	-	-
HCM 95th %tile Q(veh)	0.4	-	-	10.3	0.7	1	0	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection

Int Delay, s/veh 119.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	80	0	75	5	0	5	90	1605	5	5	1590	95
Future Vol, veh/h	80	0	75	5	0	5	90	1605	5	5	1590	95
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	100	-	-	-	100	-	-	100	-	250
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	84	0	79	5	0	5	95	1689	5	5	1674	100

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2719	3568	837	2729	3666	847	1774	0	0	1694	0	0
Stage 1	1684	1684	-	1882	1882	-	-	-	-	-	-	-
Stage 2	1035	1884	-	847	1784	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	~ 10	6	310	10	5	305	347	-	-	373	-	-
Stage 1	98	149	-	73	118	-	-	-	-	-	-	-
Stage 2	248	118	-	323	133	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	~ 8	4	310	6	4	305	347	-	-	373	-	-
Mov Cap-2 Maneuver	~ 8	4	-	6	4	-	-	-	-	-	-	-
Stage 1	~ 71	147	-	53	86	-	-	-	-	-	-	-
Stage 2	177	86	-	238	131	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, $	2689.6	$ 622.6	1	0
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	347	-	-	8	310	12	373	-	-
HCM Lane V/C Ratio	0.273	-	-	-10.526	0.255	0.877	0.014	-	-
HCM Control Delay (s)	19.2	-	-	$ 5191.8	20.5	$ 622.6	14.8	-	-
HCM Lane LOS	C	-	-	F	C	F	B	-	-
HCM 95th %tile Q(veh)	1.1	-	-	12.1	1	1.9	0	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon