DRAFT

Jeff's Review Copy - 4-19-00

TECHNICAL MEMORANDUM

TO: Mr. Jeff Markiewicz, P.E.
Town of Addison

FROM: Thomas A. Brown, E.I.T. TAB
Bridgette K. Shamburger, P.E. BKS
Kimley-Horn and Associates, Inc.

DATE: March 2, 2000

SUBJECT: Traffic Safety and Operational Analysis and Review of the Belt Line Road/ Midway Road Intersection in Addison, Texas

Introduction

The intersection of Belt Line Road and Midway Road is scheduled for reconstruction. This reconstruction will add dual-left turns on all approaches, a right turn lane on three approaches, new traffic signalization, as well as new pavement markings and signing. State Farm Insurance has identified this intersection as a high accident location. Accordingly, the intent of this reconstruction is to help alleviate some of these accidents while having a positive effect on traffic operations at the intersection.

This technical memorandum presents a review of existing geometric, sight distance, and traffic control conditions. In addition, accident data for the last three years is summarized and high frequency accidents noted. The results of an operational analysis under both existing and proposed geometric conditions are presented, and recommendations made on how to further improve intersection operations. Finally, the intersection improvement plans and specifications are reviewed for constructability, sight distance, turning radii, drainage, traffic signalization, access, pavement markings, and signing. The emphasis of this review is on identifying safety concerns.

Existing Conditions Analysis

A photo log summary of existing conditions at the intersection is included in the **Appendix**. The intersection currently has a single left and three through lanes in each direction. The northbound approach has a separate right turn lane—all other approaches use the outermost through lane to accommodate right turns. Signalized intersection analysis under existing roadway conditions was performed for the weekday AM and PM peak hours using Synchro™ signal operations software. The traffic volumes used in this analysis were taken directly from field counts performed at the intersection on February 15th, 2000—the count data sheets can be found in the **Appendix**. The results of the analysis are summarized in **Table 1**.

Table 1: Existing Geometry

AM Peak			PM Peak		
delay (s)	LOS	v/c	delay (s)	LOS	v/c
110	F	1.15	77	E	1.03

The Level of Service (LOS) of an intersection is directly related to the delay at the intersection. Synchro uses total control delay to find LOS, and the delay threshold to go from LOS E to LOS F is 78 seconds. Although it is listed as a LOS E, Synchro analysis indicates that, in the PM Peak hour, the intersection operates very near a LOS F.

The actual signal timing at the intersection for the corresponding peak period was field verified and input in Synchro for the analysis outlined in the table above. Currently, all left turns are operated on a protected/permitted basis, while right turns are operated on a permitted only basis. The southbound left turn lags the corresponding through movement, as does the westbound left turn.

Field observation shows that when a truck is in the left turn lane, the left turn signal is blocked from view to others motorists in the left turn lane. A blocked signal will reduce motorists' reaction times because the yellow warning cannot be seen to anticipate that another vehicle might stop.

Accident Data

Accident reports since January 1, 1997 were obtained from the Town of Addison Police Department for accidents that occurred within 250 feet of the intersection. A summary of the accident data is included in the Appendix. **Figures 1A-1D** graphically depict the accident data as well. The annual number of reported accidents ranged from 26 in 1997 to 31 in 1999. Inspection of the accident data revealed that a majority of the accidents occurring at the intersection of Belt Line Road and Midway Road are rear-end collisions. Of the 45 total rear-end collisions, 27 of them occurred on the westbound approach to the intersection. Typically, rear-collisions at intersections can be decreased slightly with the increase of capacity as is proposed at this location. However, with the number of rear-end collisions being disproportionately larger on the westbound approach, it appears that a modification in the traffic signal operations and coordination would decrease the number of rear-end collisions.

Upon investigation of the rear-end collisions, it was also determined that over 68 percent of the collisions occurred on wet pavement. There were also five (5) single vehicle accidents that occurred during the study period that were attributable to wet pavement. While driver aggression and inattention are factors in this type of collision, improvements to existing pavement could result in a decrease of accidents occuming on wet pavement.

Further accident analyses revealed that 16 collisions occurred involving a left-turning vehicle turning during a permitted phase being struck by an oncoming vehicle. As an example, a westbound left turning vehicle entered the intersection during the permitted left-turn phase and was struck by an eastbound through vehicle. These types of accidents will be reduced by the omission of the permitted left-tum phasing. Allowing left turns only during a protected phase will decrease the possible number of conflicts at this intersection.

Operational Analysis

The proposed intersection improvements will add dual left turns in all directions, and a separate right turn lane in the southbound and eastbound directions. In addition

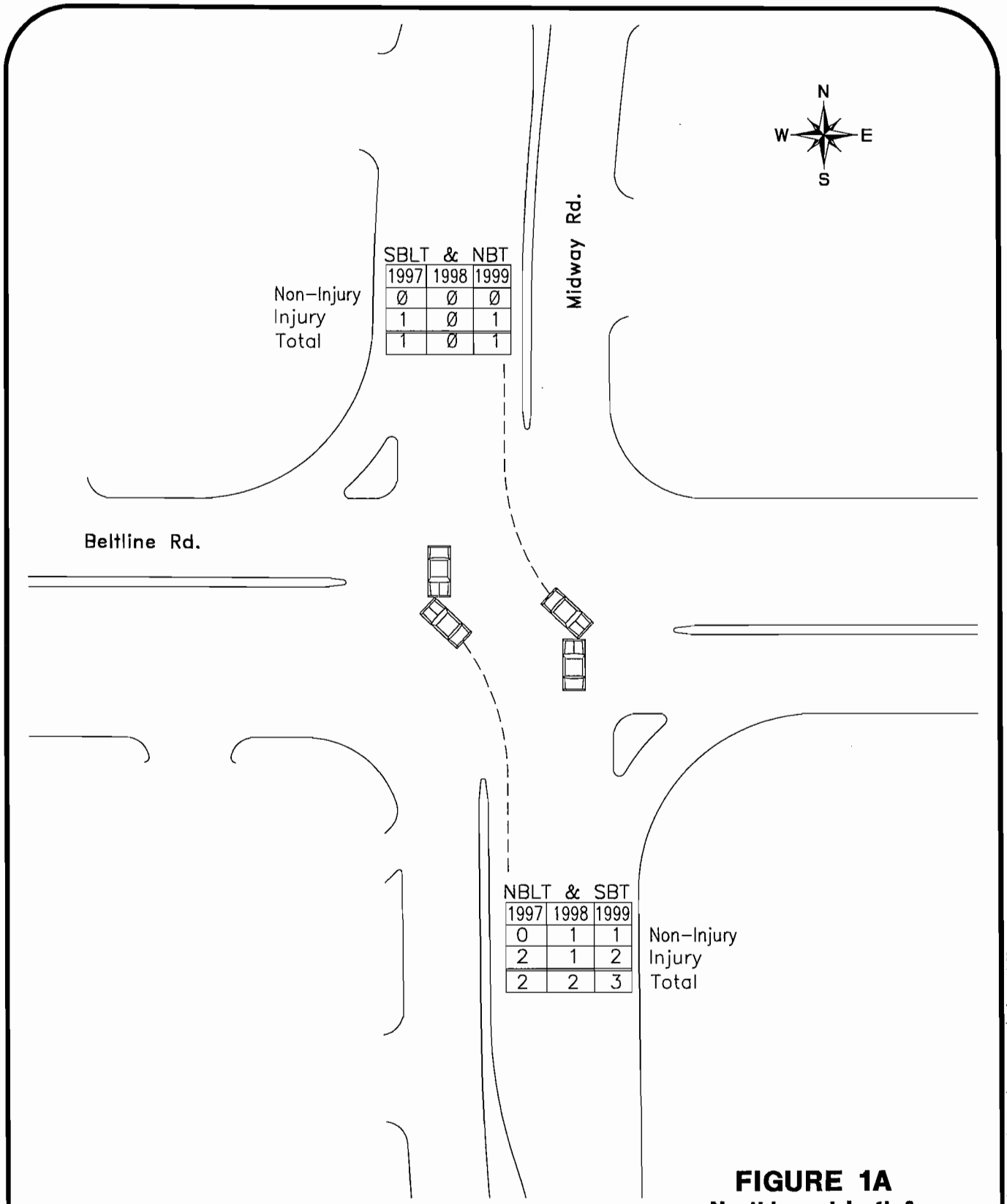

FIGURE 1A

Northbound Left & Southbound Left Right Angle Collisions

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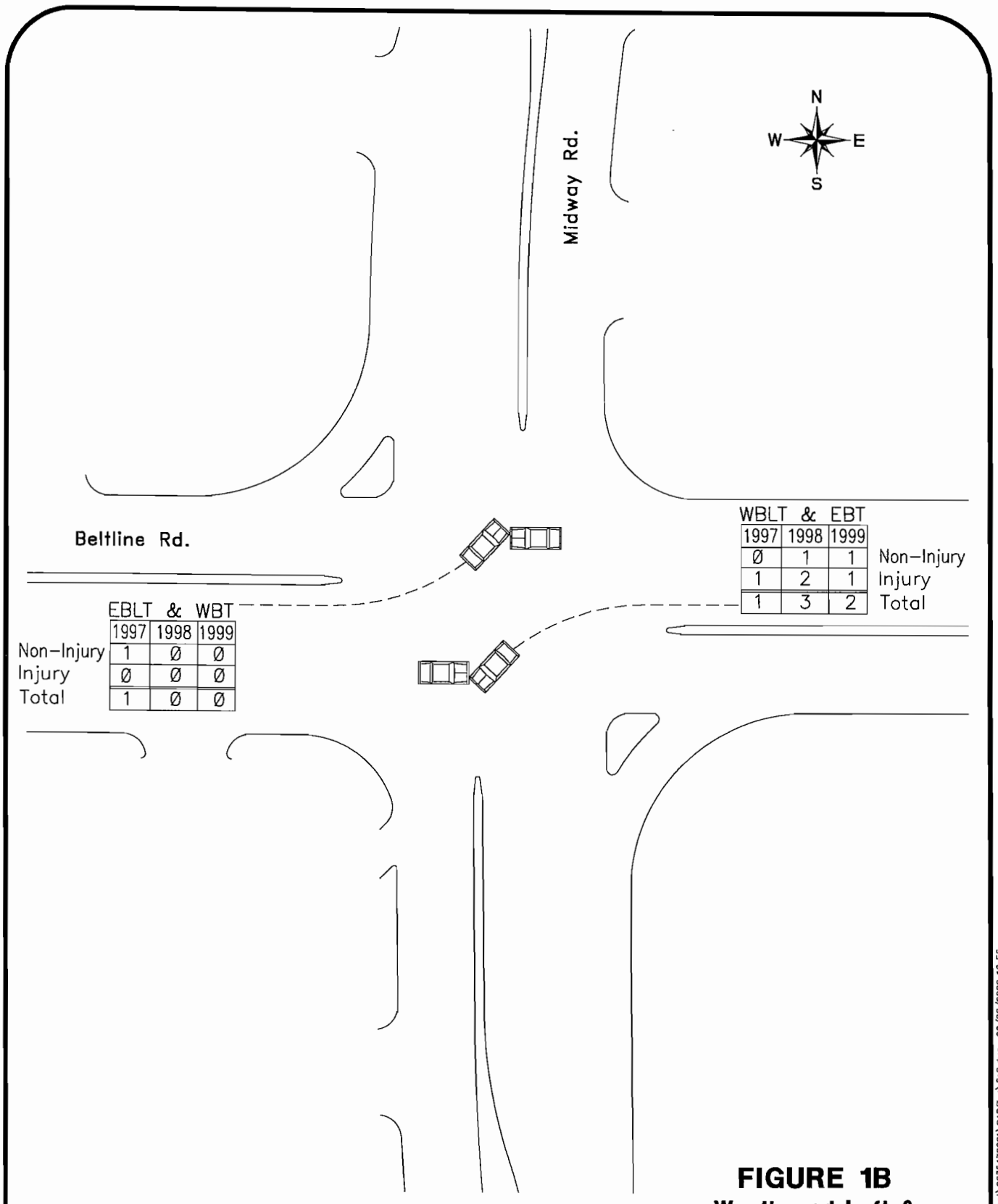

FIGURE 1B

Westbound Left & Eastbound Left Right Angle Collisions

Kimley-Horn and Associates, Inc.

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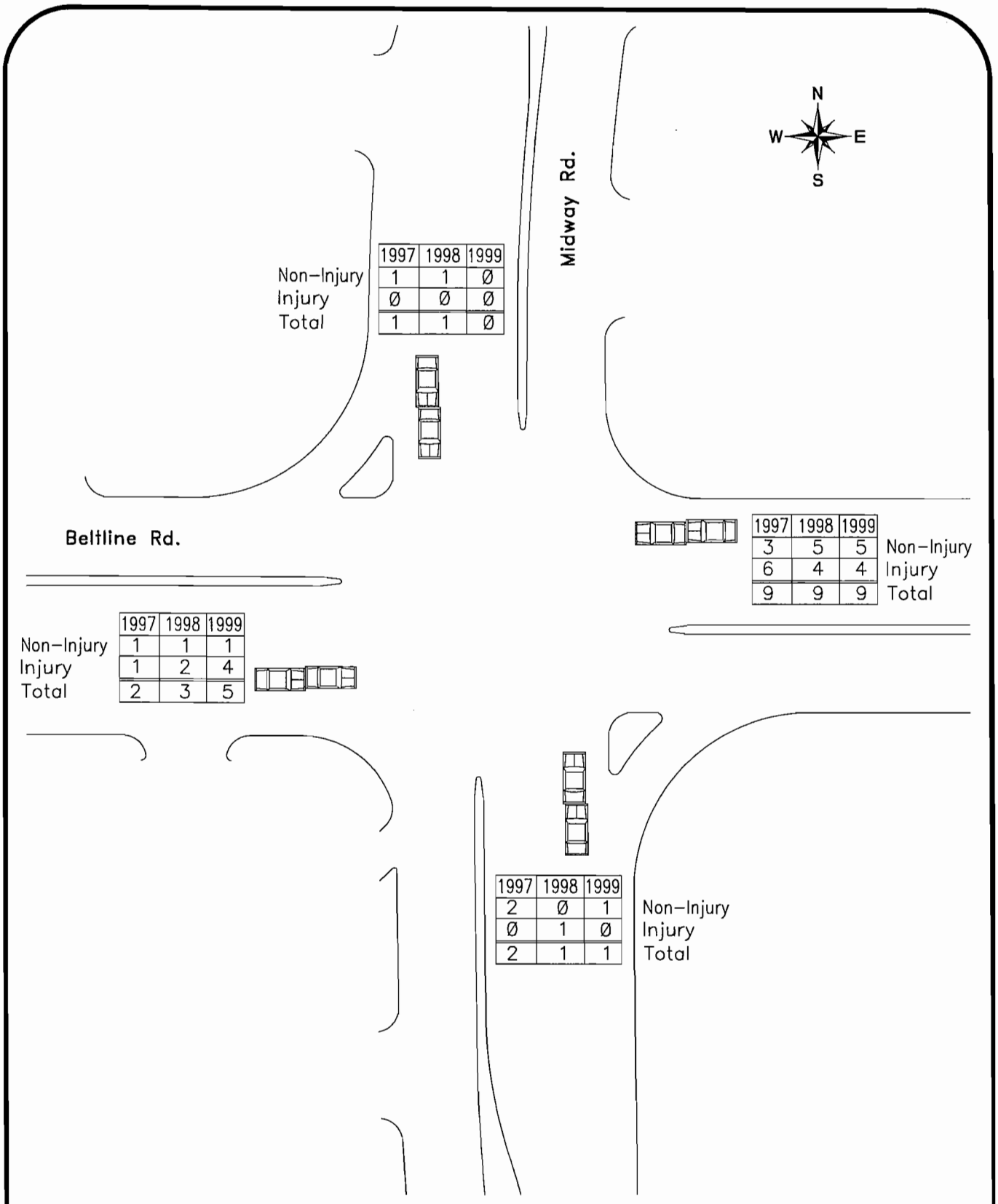

FIGURE 1C

Rear-end Collisions

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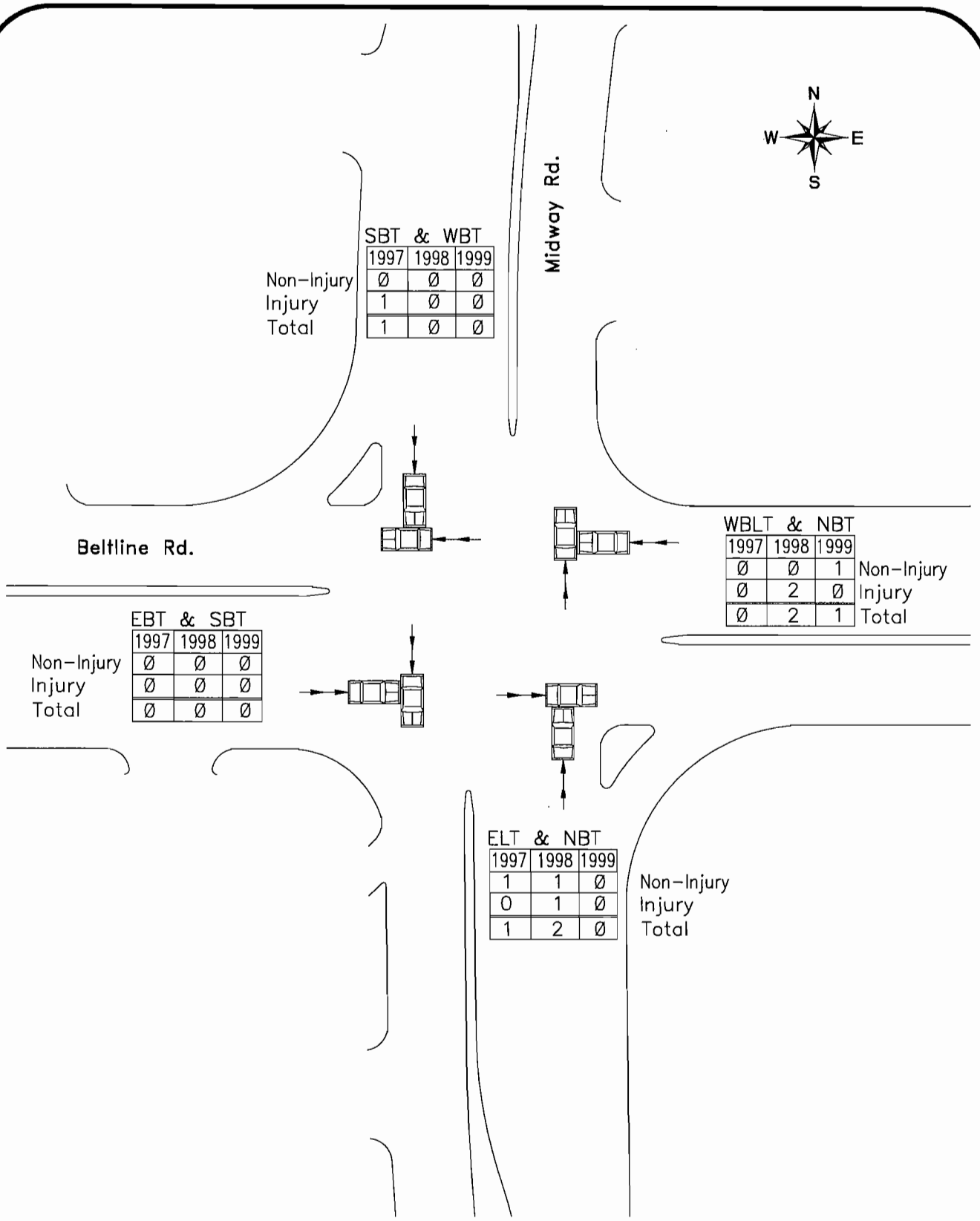

FIGURE 1D
Right Angle Collisions

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XREF = G:\TPTO\PROJECT\063543000\CAOFILES\XB511

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to increasing the capacity of an intersection, the upgrade from single lefts to dual lefts necessitates the use of protected only left turn phases in all directions, which will reduce the number of potential conflicts between left turning traffic and through traffic from the opposite direction.

Due to increased visibility, the new traffic signals are expected to help reduce collisions, especially in the left turn bays. The new design calls for two mast-arm mounted left turn signals opposite of each left turn lane, instead of one pole-mounted left turn signal. The new left turn signal configuration makes it more difficult for a truck to completely block the left turn indication from view.

Table 1 on the previous page of this memorandum shows that the intersection currently operates at a LOS F for the weekday AM peak hour, and LOS E/F during the weekday PM peak hour. Queueing analysis shows heavy queues building up in all directions, and field reconnaissance shows that many vehicles currently wait through two cycles on all four approaches of the intersection. This observation is in line with the average delay modeled by Synchro™ signal operations software for existing conditions, which showed almost 2 minutes of average delay per vehicle in the AM Peak Hour. Signalized intersection analysis was performed for the intersection with the proposed geometrics in place using Synchro™ signal operations software. **Table 2** outlines the results of this analysis.

Table 2: Proposed Geometry

AM Peak			PM Peak		
delay (s)	LOS	v/c	delay (s)	LOS	v/c
53	D	0.97	48	D	0.90

The proposed intersection improvements are expected to increase the capacity of the intersection to the point that existing volumes of traffic will experience a LOS D in both the AM and PM peak hours. The average delay per vehicle is expected to be reduced by 50 percent during the AM peak hour and almost 40 percent in the PM Peak.

Plans and Specifications Review

The paving, drainage, and traffic control plans were reviewed by Kimley-Horn

staff. The specific paving sheets that were reviewed are in the **Appendix**. The paving sheets have a call out that states that the driveway radii are 15' unless shown otherwise; however, all the driveway radii appear to be 10'. We recommend the driveway radii be 15'. Additional comments are as follows:

- Sheet 16 – We recommend that the transitions to the existing section be straight tapers instead of curved (see curves 8-11). Although, the curves can be built, it would be easier to construct if they were straight.

- Sheet 17 – We recommend the transitions to the existing section be straight tapers instead of curved (see curves 14, 19, 22, 90, 91, 92). Although, the curves can be built, it would be easier to construct if they were straight. In addition, there appears to be a shift in the eastbound mainlanes from station 54+55.49 to 55+57.20. The lanes shift to the left, then back to the right within 100 feet. We recommend avoiding the shift and straightening the lanes. Also, consider removing the driveway at 56+45.80. The drive turns into an existing building and does not appear to help the circulation of the property. There is an additional driveway 65' to the west that could be utilized. Another driveway at 3+90 is very close to the intersection; consider removing the driveway and utilizing the driveway at 3+03. Both drives serve the same property.

- Sheet 18 – We recommend that the transitions to the existing section be straight tapers instead of curved tapers (see curves 40-43, 36-37). Although, the curves can be built, it would be easier to construct if they were straight.

- Sheet 19 – A raised curb island obstructs the path of southbound vehicles turning right into the driveway at 7+05.08. Consider removing a portion of the island back away from the driveway. In addition, the proposed improvements will reduce the drive aisle on the adjacent property from 26 feet to 16 feet. Consider widening this drive aisle.

CONCLUSIONS AND RECOMMENDATIONS

- The proposed geometric improvements are expected to reduce collisions at the intersection by increasing the visibility of traffic control devices and separating conflicting movements.

- We recommend that driveway radii be 15' unless otherwise noted.

- Consider making curb transitions straight tapers instead of curved tapers for ease of construction.

- Consider straightening the shift in the eastbound mainlanes from station 54+55.49 to 55+57.20. (Sheet 17)

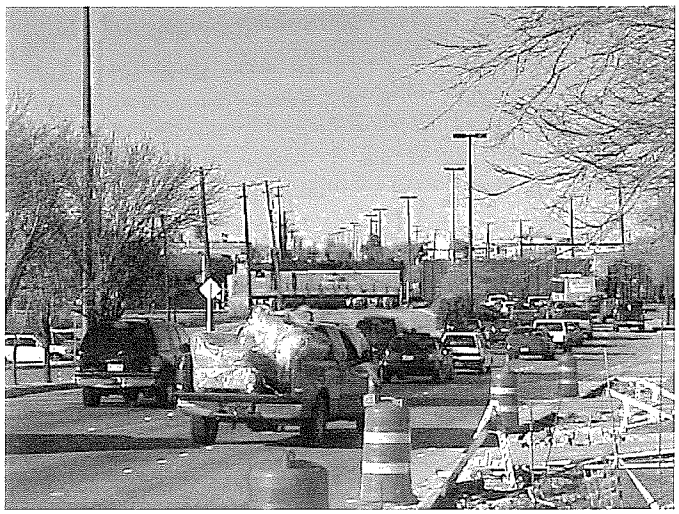
- Consider removing the driveways at 56+45.80 and 3+90. (Sheet 17)

- Consider cutting back an island that will obstruct southbound vehicles turning right into the driveway at 7+05.08. Also, consider widening the drive aisle adjacent to Midway Road at this driveway. This drive aisle is reduced from 26 feet to 16 feet by the proposed geometric changes. (Sheet 19)

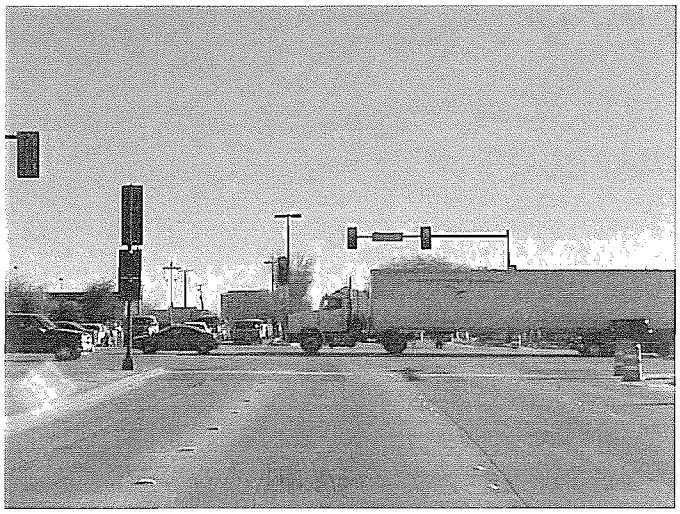
APPENDIX

PHOTOLOG SUMMARY

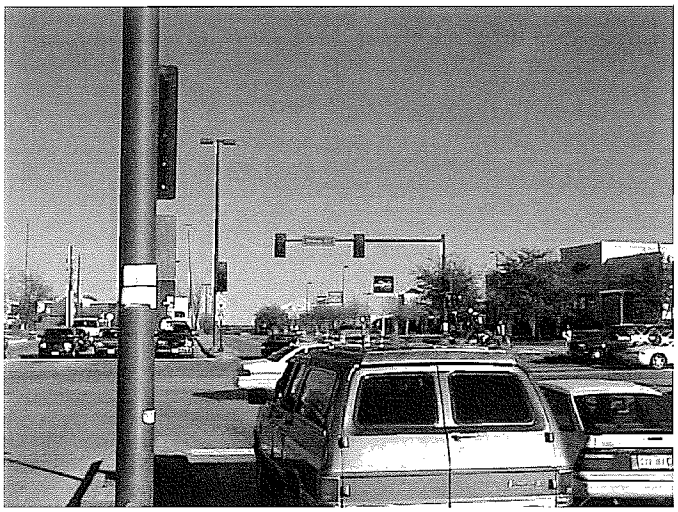
Belt Line Road & Midway Road Intersection (pg. 1 of 3)



Looking north away from the intersection

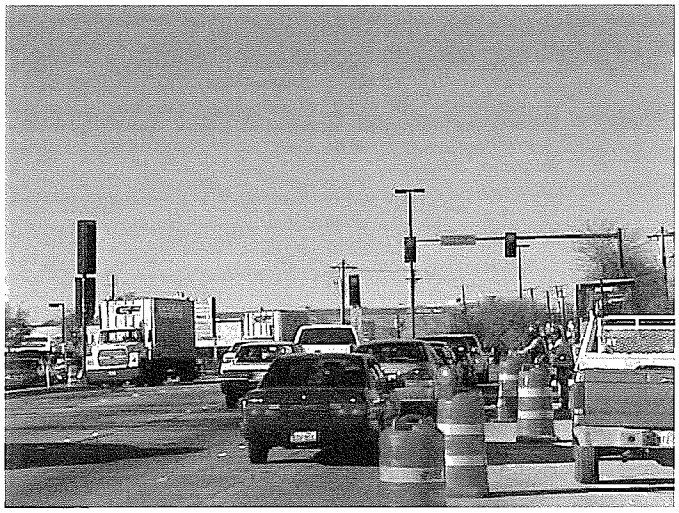


Facing south on Midway

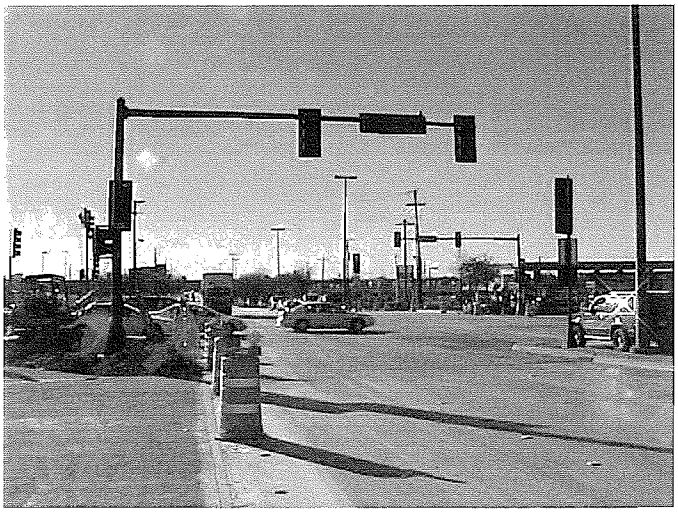


Looking east from the Midway median

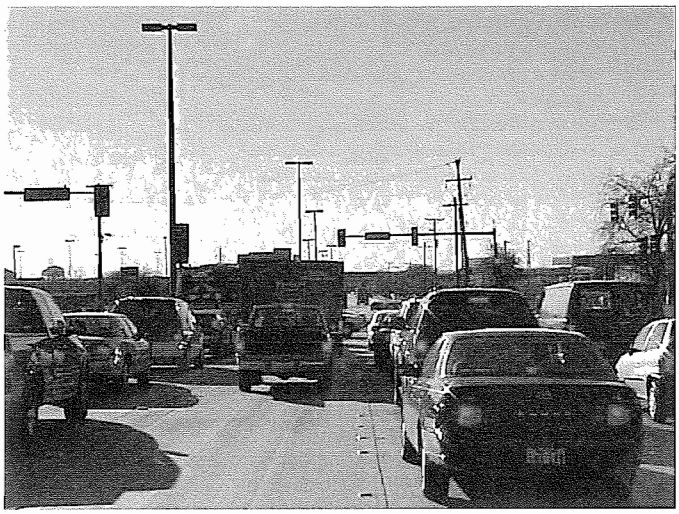
Looking east from the through lanes on Midway



Northbound Midway



Looking west on the south side of Belt Line Road

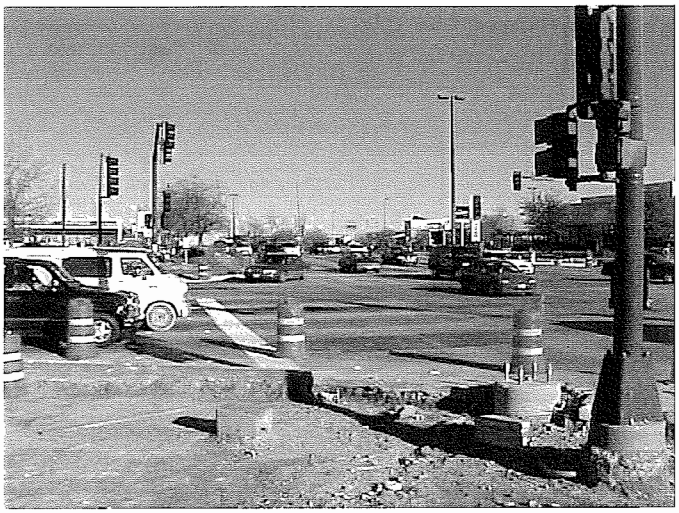


Facing west on Belt Line Road

View from the northeast corner of the intersection

View from the northeast corner of the intersection

View from the northwest corner of the intersection



View from the northwest corner of the intersection

View from the southwest corner of the intersection

Belt Line Road & Midway Road Intersection (pg. 3 of 3)

View from the southwest corner of the intersection

ACCIDENT DATA SUMMARY

ID	TOD	Date	Year	Type	Approach	Injury	No. Veh	Wet Pvmt	Comments
1	19:18	9/20	1997	LTRA	SBLT	Y	2	N	Both vehicles had Yellow light. SBLT turned in front of NBT
2	22:10	10/20	1997	LTRA	WBLT	Y	2	N	WBLT IN FRONT OF EBT
3	7:10	2/26	1997	LTRA	NBLT	Y	3	Y	NBLT IN FRONT OF SBT - SBT HAD RT TURN SIGNAL ON BUT DID NOT TURN
4	20:31	11/13	1997	LTRA	NBLT	Y	2	Y	NBLT TRACTOR TRAILER LT IN FRONT OF SBRT
5	18:16	6/22	1997	RA	WB&SBLT	Y	2	N	WB RAN LIGHT IN FRONT OF SBLT
6	10:34	2/19	1997	RA	NB&EB	N	3	Y	NB RAN LIGHT IN FRONT OF EB
7	21:32	4/23	1997	LTRA	EBLT	N	2	N	EBLT IN FRONT OF WB WITH ONLY GREEN BALL
8	19:40	9/22	1997	PED	NBLT	Y	1	Y	NBLT RAN INTO PED SB
9	14:50	11/29	1997	RE	NB	N	2	Y	
10	20:00	9/17	1997	RE	NB	N	2	N	RAN INTO BACK OF NBRT
11	17:11	8/7	1997	RE	SB	N	2	Y	COULD NOT STOP ON WET PAVEMENT
12	11:22	5/7	1997	RE	EB	Y	3	N	TRACTOR TRAILER RAN INTO BACK OF VEH PUSHING INTO ANOTHER
13	13:42	12/26	1997	RE	EB	N	2	Y	
14	12:47	10/22	1997	RE	WB	Y	2	N	DRIVER DUI
15	13:10	4/18	1997	RE	WB	Y	2	N	
16	19:13	9/22	1997	RE	WB	Y	2	Y	FRONT CAR SLID TO A STOP AND SECOND VEHICLE SLID INTO IT
17	21:24	11/12	1997	RE	WB	Y	3	Y	VEH 1 RAN INTO 2 AND PUSHED IT INTO 3
18	14:05	12/7	1997	RE	WB	Y	3	Y	
19	6:55	10/7	1997	RE	WB	N	2	Y	FIRST VEH SLID TO STOP SIDEWAYS AND SECOND VEH IMPACTED
20	6:22	2/19	1997	RE	WB	Y	3	Y	
21	15:04	12/2	1997	RE	WB	N	2	Y	
22	16:31	7/6	1997	RE	WB	N	2	Y	SLID INTO VEH - DUI
23	6:20	2/19	1997	OTH	NB	Y	1	Y	NBLT LOST CONTROL AND CROSSED MEDIAN INTO EB LANES
24	23:38	10/4	1997	OTH	WB	Y	2	N	VEH 1 DROVE ACROSS MEDIAN INTO ONCOMING TRAFFIC
25	21:11	4/20	1997	OTH	SB	N	1	Y	SB VEH RAN INTO POLE IN THE MEDIAN
26	18:05	7/3	1997	SIDE	SB	N	2	N	LT FROM WRONG LANE
27	2:17	9/26	1998	RA	NB&WB	Y	3	N	NB RAN LIGHT IN FRONT OF WB
28	21:58	1/3	1998	RA	WB&NB	Y	4	Y	WB VEH SLID INTO INTERSECTION STRIKING NB
29	22:24	1/29	1998	RA	NB&EB	Y	2	N	NB RAN RED LIGHT
30	14:38	3/15	1998	LTRA	WBLT	Y	2	N	WBLT TRYING TO CLEAR INTERSECTION AFTER RED LIGHT HIT BY EBT ENTERING AFTER RED
31	10:46	3/25	1998	LTRA	WBLT	Y	2	N	WBLT PERMITTED TURNED IN FRONT OF EBT
32	17:28	6/28	1998	LTRA	NBLT	N	2	N	NBLT STRUCK BY SBT
33	15:46	7/22	1998	RA	NB&EB	N	3	N	NBT RAN RED LIGHT
34	10:11	8/14	1998	LTRA	NBLT	Y	2	N	NBLT TRYING TO CLEAR INTERSECTION HIT BY SBT
35	22:45	3/22	1998	SIDE	SBRT	N	2	N	RTOR - HIT BY WBT
36	20:09	5/10	1998	LTRA	WBLT	N	2	N	WBLT PERMITTED TURNED IN FRONT OF EBT
37	9:58	2/18	1998	PED	NBLT	Y	1	N	PED CROSSED AGAINST SIG
38	15:14	4/15	1998	RE	WB	Y	2	Y	SLID INTO VEH

ID	TOD	Date	Year	Type	Approach	Injury	No. Veh	Wet Pvmt	Comments
39	15:20	2/16	1998	RE	WB	Y	4	Y	SLID INTO VEH
40	23:10	5/8	1998	RE	WB	Y	3	Y	
41	8:13	12/21	1998	RE	WB	Y	2	Y	SLID INTO VEH
42	11:20	1/31	1998	RE	WB	N	2	Y	SLID INTO VEH
43	22:45	5/8	1998	RE	WB	N	2	Y	
44	22:15	9/24	1998	RE	WB	N	2	N	
45	18:42	5/8	1998	RE	WB	N	2	N	EVASIVE ACTION CAUSED IMPACT
46	23:12	8/20	1998	RE	EB	Y	2	N	POSSIBLE DUI
47	15:45	3/15	1998	RE	EB	Y	2	Y	
47	12:37	3/7	1998	RE	EB	N	2	Y	
49	19:08	2/21	1998	RE	WB	N	2	Y	
50	19:29	3/21	1998	RE	NB	Y	2	N	
51	10:48	7/21	1998	RE	NB	N	2	N	GREEN LIGHT BUT TRAFFIC DID NOT GO
52	14:10	7/10	1998	RE	SB	N	2	N	TRUCK TOWING VEH STRUCK OTHER VEH FROM BEHIND
53	14:10	3/6	1998	OTH		Y	2	Y	EB VEH LOST CONTROL AND SLID OVER MEDIAN STRIKING WBLT
54	9:15	6/11	1998	RE	NB	Y	2	Y	NB SAID CYCLE WENT GREEN, YELLOW, GREEN AND SHE STOPPED IN INTERSECTION - STRUCK FROM BEHIND
55	2:05	3/3	1998	OTH	EB	N	1	N	DUI - EB STRUCK LIGHT POLE IN MEDIAN
56	9:05	3/7	1998	SIDE	NBRT	N	2	N	RTOR - HIT BY EBT
57	16:34	11/29	1999	SIDE	WBRT	Y	2	N	RTOR HIT BY EBLT
58	11:01	8/7	1999	LTRA	WBLT	Y	2	N	MOTORCYCLE HIT WBLT
59	8:50	12/3	1999	LTRA	NBLT	Y	2	N	NBLT FOLLOWED TRACTOR TRAILER THOUGH LT, BUT TRAILER OBSTRUCTED VIEW OF SIGNAL HEAD.
60	6:15	4/2	1999	LTRA	NBLT	Y	3	N	NBLT DURING PERMITTED PHASE IN FRONT OF SBT
61	20:24	8/15	1999	LTRA	SBLT	Y	3	N	SBLT CLEARING INTERSECTION AFTER YELLOW THOUGHT NBT WOULD STOP
62	22:34	1/29	1999	LTRA	NBLT	N	3	Y	NBLT TURNED IN FRONT OF SBT
63	12:07	10/9	1999	RA	NB&WB	N	2	Y	WB SLID INTO INTERSECTION AND WAS STRUCK BY NB THAT HAD GREEN LIGHT
64	14:54	10/26	1999	LTRA	WBLT	N	2	N	WBLT STRUCK BY EBT
65	20:15	1/27	1999	RE	WB	Y	3	N	
66	20:09	9/5	1999	RE	WB	Y	4	Y	
67	22:54	9/10	1999	RE	WB	Y	2	Y	SLID INTO VEH
68	20:45	3/18	1999	RE	WB	Y	2	Y	
69	9:42	5/26	1999	RE	WB	N	2	Y	SLID INTO VEH
70		5/2	1999	RE	WB	N	2	Y	SLID INTO VEH
71	19:48	1/25	1999	RE	WB	N	3	N	
72	0:16	3/28	1999	RE	WB	N	2	Y	SLID INTO VEH
73	20:00	7/3	1999	RE	WB	N	2	N	
74	17:20	12/12	1999	RE	NB	N	2	Y	SLID INTO VEH
75	15:25	3/10	1999	RE	EB	Y	2	N	
76	7:00	4/14	1999	RE	EB	Y	2	Y	SLID INTO VEH
77	11:04	10/17	1999	RE	EB	Y	3	Y	FIRST VEH SPUN OUT ON WET PAVEMENT. FOLLOWING VEH COULD NOT STOP
78	20:23	9/5	1999	RE	EB	Y	2	Y	DRIVER LOST CONTROL & SLID ITNO VEH
79	20:20	9/10	1999	RE	EB	N	2	Y	SLID INTO VEH

ID	TOD	Date	Year	Type	Approach	Injury	No. Veh	Wet Pvmt	Comments
80	12:40	10/17	1999	SIDE	SB	Y	2	Y	TRACTOR TRAILER LOST CONTROL & TRAILER SIDE SWIPED VEH STOPPED AT SIGNAL
81	21:21	1/28	1999	OTH	WB	N	1	Y	EVASIVE ACTION RESULTED IN DRIVER LOSING CONTROL AND HITTING TREE IN MEDIAN
82	21:02	3/7	1999	OTH	WBLT	N	1	Y	WET ROAD; TOO HIGH SPEED; LOST CONTROL IN TURN AND STRUCK LIGHT POLE
83	5:56	12/4	1999	OTH	WBT	N	1	Y	WBT LOST CONTROL AND RAN OVER MEDIAN, STRIKING TREE.
84	12:48	4/15	1999	OTH	NB	N	2	N	DRIVER MERGED IN FRONT OF ANOTHER DRIVER
85	9:46	9/8	1999	OTH	SB	N	2	Y	TRACTOR TRAILER SB ATTEMPTING TO MAKE RIGHT TURN SLID INTO SIGNAL POLE THAT FELL ON WBLT
86	19:14	9/25	1999	SIDE	NB	N	2	Y	NBLT SLID INTO NBT DURING TURN
87	23:29	1/14	1999	OTH	WBLT	N	2	N	DRIVER MADE WIDE WBRT CROSSING MEDIAN AND HITTING SBT VEH
88	12:05	1/18	2000	LTRA	SBLT	Y	2	N	SBLT PERMITTED LT IN FRONT OF NB
89	15:53	1/7	2000	RE	WB	Y	2	Y	
90	16:14	1/7	2000	RE	WB	N	2	Y	
91	2:18	1/1	2000	OTH	NBRT	N	1	Y	NBRT SLID OUT OF CONTROL & STRUCK LIGHT POLE IN MEDIAN

All Accidents

Year	1997	1998	1999	Total
Injury	15	16	14	45
Non-Injury	11	14	17	42
Total	26	30	31	87

Wet Pavement

Year	1997	1998	1999	Total
Injury	8	8	7	23
Non-Injury	8	4	12	24
Total	16	12	19	47

Rearends

Year	1997	1998	1999	Total
Injury	7	8	8	23
Non-Injury	7	8	7	22
Total	14	16	15	45

Wet Pavement Rearends

Year	1997	1998	1999	Total
Injury	4	6	6	16
Non-Injury	6	4	5	15
Total	10	10	11	31

Single Vehicle Accidents

Year	1997	1998	1999	Total
Injury	1	0	0	1
Non-Injury	1	1	3	5
Total	2	1	3	6
Wet	2	0	3	5

Left-Turn Right Angle

Year	1997	1998	1999	Total
Injury	4	3	4	11
Non-Injury	1	2	2	5
Total	5	5	6	16

Right Angle

Year	1997	1998	1999	Total
Injury	1	3	0	4
Non-Injury	1	1	1	3
Total	2	4	1	7

Other Accidents

Year	1997	1998	1999	Total
Injury	3	2	2	7
Non-Injury	2	3	7	12
Total	5	5	9	19

TRAFFIC COUNTS

ADDISON
BELT LINE & MIDWAY
2-15-00

METROCOUNT
9128 COUPLES DR.
PLANO, TEXAS 75025
PHONE/FAX (972) 359-7882

Site Code : 00000111
Start Date: 02/15/00
File I.D. : 111
Page : 1

Movement 1

	MIDWAY Southbound				BELT LINE Westbound				MIDWAY Northbound				BELT LINE Eastbound				
Start Time	Rght	Thru	Left	Totl	Rght	Thru	Left	Totl	Rght	Thru	Left	Totl	Rght	Thru	Left	Totl	Total
7:00am	13	318	55	386	114	162	43	319	35	148	22	205	30	218	26	274	1184
7:15	34	413	83	530	72	296	74	442	42	170	30	242	50	293	37	380	1594
7:30	28	514	100	642	57	311	81	449	53	151	22	226	59	286	32	377	1694
7:45	25	410	85	520	66	393	86	545	58	186	36	280	67	345	33	445	1790
Hour Total	100	1655	323	2078	309	1162	284	1755	188	655	110	953	206	1142	128	1476	6262
8:00am	14	444	108	566	78	277	55	410	59	199	32	290	55	345	38	438	1704
8:15	29	384	90	503	57	252	83	392	58	193	28	279	54	323	34	411	1585
8:30	30	419	118	567	65	273	72	410	68	147	27	242	47	329	40	416	1635
8:45	21	344	79	444	77	282	88	447	43	174	34	251	52	273	34	359	1501
Hour Total	94	1591	395	2080	277	1084	298	1659	228	713	121	1062	208	1270	146	1624	6425
*** Break ***																	
4:45	32	212	76	320	83	328	55	466	79	277	54	410	42	343	53	438	1634
Hour Total	32	212	76	320	83	328	55	466	79	277	54	410	42	343	53	438	1634
5:00pm	26	239	62	327	74	388	76	538	74	335	65	474	51	333	41	425	1764
5:15	40	306	65	411	81	385	80	546	63	336	55	454	50	347	59	456	1867
5:30	31	209	58	298	63	421	82	566	78	338	69	485	43	343	41	427	1776
5:45	46	241	64	351	85	360	67	512	85	310	69	464	47	323	62	432	1759
Hour Total	143	995	249	1387	303	1554	305	2162	300	1319	258	1877	191	1346	203	1740	7166
6:00pm	33	191	64	288	80	395	73	548	79	286	67	432	52	339	42	433	1701
6:15	40	247	79	366	67	319	76	462	95	270	53	418	50	339	52	441	1687
6:30	25	163	54	242	114	347	107	568	88	242	47	377	61	297	45	403	1590
Total	98	601	197	896	261	1061	256	1578	262	798	167	1227	163	975	139	1277	4978
Grand	467	5054	1240	6761	1233	5189	1198	7620	1057	3762	710	5529	810	5076	669	6555	26465
% of Total	1.8%	19.1%	4.7%		4.7%	19.6%	4.5%		4.0%	14.2%	2.7%		3.1%	19.2%	2.5%		
Apprch %				25.5%				28.8%				20.9%				24.8%	
% of Apprch	6.9%	74.8%	18.3%		16.2%	68.1%	15.7%		19.1%	68.0%	12.8%		12.4%	77.4%	10.2%		

Peak Hour Analysis By Entire Intersection for the Period: 07:00am to 08:45am on 02/15/00

Direction	Street Name	Start Peak Hour	Peak Hr Factor	Volumes Rght	Thru	Left	Total	Percentages Rght	Thru	Left
Southbound	MIDWAY	07:15am	.879	101	1781	376	2258	4.4	78.8	16.6
Westbound	BELT LINE		.847	273	1277	296	1846	14.7	69.1	16.0
Northbound	MIDWAY		.895	212	706	120	1038	20.4	68.0	11.5
Eastbound	BELT LINE		.921	231	1269	140	1640	14.0	77.3	8.5

Peak Hour Analysis By Entire Intersection for the Period: 04:45pm to 06:30pm on 02/15/00

Direction	Street Name	Start Peak Hour	Peak Hr Factor	Volumes Rght	Thru	Left	Total	Percentages Rght	Thru	Left
Southbound	MIDWAY	05:00pm	.844	143	995	249	1387	10.3	71.7	17.9
Westbound	BELT LINE		.955	303	1554	305	2162	14.0	71.8	14.1
Northbound	MIDWAY		.968	300	1319	258	1877	15.9	70.2	13.7
Eastbound	BELT LINE		.954	191	1346	203	1740	10.9	77.3	11.6

SYNCHRO OUTPUT

Lanes, Volumes, Timings

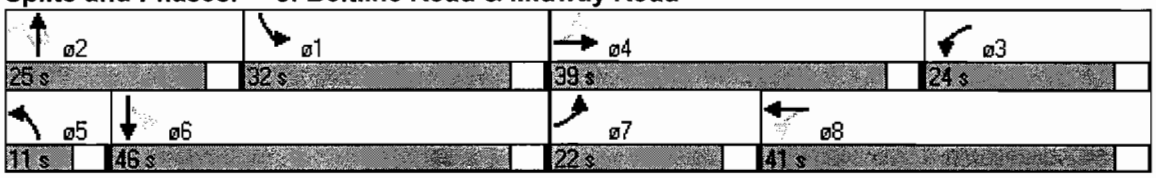
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	11	10	10	11	10	10	11	10	10	11	10
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	200		0	200		0	200		200	200		0
Storage Lanes	1		0	1		0	1		1	1		0
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Leading Detector (ft)	50	50		50	50		50	50	50	50	50	
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	0.91	0.91	1.00	0.91	0.91	1.00	0.91	1.00	1.00	0.91	0.91
Frt Protected		0.977			0.974				0.850		0.992	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1652	4803	0	1652	4788	0	1652	4916	1478	1652	4876	0
Frt Perm.		0.977			0.974				0.850		0.992	
Flt Perm.	0.111			0.105			0.182			0.306		
Satd. Flow (perm)	193	4803	0	183	4788	0	316	4916	1478	532	4876	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		31			41				236		8	
Headway Factor	1.09	1.04	1.09	1.09	1.04	1.09	1.09	1.04	1.09	1.09	1.04	1.09
Volume (vph)	140	1269	231	296	1277	273	120	706	212	376	1781	101
Confl. Peds. (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.85	0.85	0.85	0.90	0.90	0.90	0.88	0.88	0.88
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	152	1379	251	348	1502	321	133	784	236	427	2024	115
Lane Group Flow (vph)	152	1630	0	348	1823	0	133	784	236	427	2139	0
Turn Type	Pm+Pt			Pm+Pt			Pm+Pt		Perm	Pm+Pt		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2		2	6		
Detector Phases	7	4		3	8		5	2	2	1	6	
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Minimum Split (s)	8.0	20.0		8.0	20.0		8.0	20.0	20.0	8.0	20.0	
Total Split (s)	22.0	39.0	0.0	24.0	41.0	0.0	11.0	25.0	25.0	32.0	46.0	0.0
Total Split (%)	18%	33%	0%	20%	34%	0%	9%	21%	21%	27%	38%	0%
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5	0.5	0.5	0.5	
Lead/Lag	Lead	Lead		Lag	Lag		Lead	Lead	Lead	Lag	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	
Recall Mode	Max	Max		Max	Max		Max	Max	Max	Max	Max	
Lane Grp Cap (vph)	289	1463		315	1544		147	901	464	461	1752	
v/s Ratio Prot	0.08	0.33		0.19	0.37		0.06	0.16		0.22	0.44	
v/s Ratio Perm	0.07			0.16			0.11		0.09	0.11		
Critical LG?		Yes			Yes			Yes			Yes	
Act Effct Green (s)	36.0	36.0		38.0	38.0		22.0	22.0	22.0	43.0	43.0	

Lanes, Volumes, Timings

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio	0.30	0.30		0.32	0.32		0.18	0.18	0.18	0.36	0.36	
v/c Ratio	0.53	1.11		1.10	1.18		0.90	0.87	0.51	0.93	1.22	
Uniform Delay, d1	32.4	41.1		47.9	39.9		43.6	47.6	0.0	41.3	38.3	
Platoon Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incr. Delay, d2	6.7	61.4		81.9	88.3		52.4	11.2	3.9	27.0	104.8	
Webster Delay	39.1	102.5		129.7	128.2		96.0	58.8	3.9	68.4	143.1	
Webster LOS	D	F		F	F		F	E	A	E	F	
Queue Length 50th (ft)	91	~525		~265	~614		93	218	0	284	~747	
Queue Length 95th (ft)	156	#624		#454	#647		#194	#284	71	#497	#813	
Link Length (ft)		420			420			420			420	
50th Up Block Time (%)		18%			31%						37%	
95th Up Block Time (%)		34%		9%	35%					13%	48%	
Turn Bay Length (ft)	200			200			200		200	200		
50th Bay Block Time %		46%		21%	50%			4%		23%	58%	
95th Bay Block Time %		53%		40%	52%		2%	22%		40%	62%	
Queuing Penalty (veh)		75		184	178			17		221	256	

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 48 (40%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 100
Control Type: Pretimed
Total Lost Time: 9
Sum of Critical v/s Ratios: 1.06
Intersection v/c Ratio: 1.15
Intersection Webster Signal Delay: 110.4
Intersection LOS: F
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Beltline Road & Midway Road



Lanes, Volumes, Timings

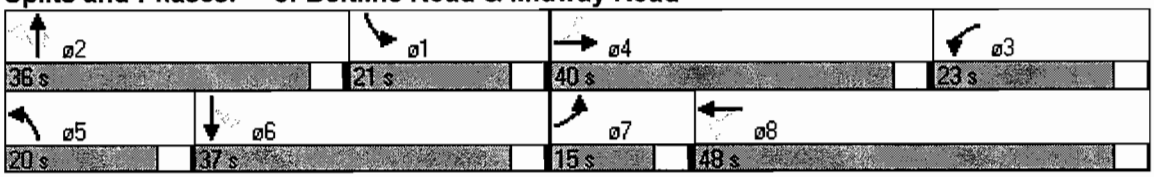
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	11	10	10	11	10	10	11	10	10	11	10
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	200		0	200		0	200		200	200		0
Storage Lanes	1		0	1		0	1		1	1		0
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Leading Detector (ft)	50	50		50	50		50	50	50	50	50	
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	0.91	0.91	1.00	0.91	0.91	1.00	0.91	1.00	1.00	0.91	0.91
Frt Protected		0.981			0.976				0.850		0.981	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1652	4822	0	1652	4798	0	1652	4916	1478	1652	4822	0
Frt Perm.		0.981			0.976				0.850		0.981	
Flt Perm.	0.108			0.089			0.121			0.131		
Satd. Flow (perm)	188	4822	0	155	4798	0	210	4916	1478	228	4822	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		22			39				231		22	
Headway Factor	1.09	1.04	1.09	1.09	1.04	1.09	1.09	1.04	1.09	1.09	1.04	1.09
Volume (vph)	203	1346	191	305	1554	303	258	1319	300	249	995	143
Confl. Peds. (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.96	0.96	0.96	0.97	0.97	0.97	0.84	0.84	0.84
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	214	1417	201	318	1619	316	266	1360	309	296	1185	170
Lane Group Flow (vph)	214	1618	0	318	1935	0	266	1360	309	296	1355	0
Turn Type	Pm+Pt			Pm+Pt			Pm+Pt		Perm	Pm+Pt		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2		2	6		
Detector Phases	7	4		3	8		5	2	2	1	6	
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Minimum Split (s)	8.0	20.0		8.0	20.0		8.0	20.0	20.0	8.0	20.0	
Total Split (s)	15.0	40.0	0.0	23.0	48.0	0.0	20.0	36.0	36.0	21.0	37.0	0.0
Total Split (%)	13%	33%	0%	19%	40%	0%	17%	30%	30%	18%	31%	0%
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5	0.5	0.5	0.5	
Lead/Lag	Lead	Lead		Lag	Lag		Lead	Lead	Lead	Lag	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	
Recall Mode	Max	Max		Max	Max		Max	Max	Max	Max	Max	
Lane Grp Cap (vph)	204	1502		308	1824		262	1352	574	278	1382	
v/s Ratio Prot	0.10	0.33		0.17	0.40		0.14	0.28		0.16	0.28	
v/s Ratio Perm	0.22			0.22			0.14		0.15	0.14		
Critical LG?		Yes			Yes		Yes	Yes			Yes	
Act Effct Green (s)	37.0	37.0		45.0	45.0		33.0	33.0	33.0	34.0	34.0	

Lanes, Volumes, Timings

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio	0.31	0.31		0.38	0.38		0.28	0.28	0.28	0.28	0.28	
v/c Ratio	1.05	1.08		1.03	1.06		1.02	1.01	0.54	1.06	0.98	
Uniform Delay, d1	34.5	40.9		47.7	36.7		40.4	43.5	8.5	49.1	41.9	
Platoon Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incr. Delay, d2	76.5	47.1		59.9	39.4		59.6	25.9	3.6	72.1	20.0	
Webster Delay	111.0	88.0		107.6	76.1		100.0	69.4	12.1	121.2	61.9	
Webster LOS	F	F		F	E		F	E	B	F	E	
Queue Length 50th (ft)	~148	~508		~238	~597		~190	~390	45	~217	376	
Queue Length 95th (ft)	#302	#606		#408	#695		#368	#500	135	#376	#424	
Link Length (ft)		420			420			420			420	
50th Up Block Time (%)		14%			20%							
95th Up Block Time (%)		32%		3%	34%			12%				
Turn Bay Length (ft)	200			200			200		200	200		
50th Bay Block Time %		43%		19%	43%		2%	35%		10%	25%	
95th Bay Block Time %	31%	51%		34%	49%		59%	45%		36%	28%	
Queuing Penalty (veh)	82	101		172	145		134	105		104	78	

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 48 (40%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 65
Control Type: Pretimed
Total Lost Time: 6
Sum of Critical v/s Ratios: 0.98
Intersection v/c Ratio: 1.03
Intersection Webster Signal Delay: 77.2
Intersection LOS: E
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Beltline Road & Midway Road



Lanes, Volumes, Timings

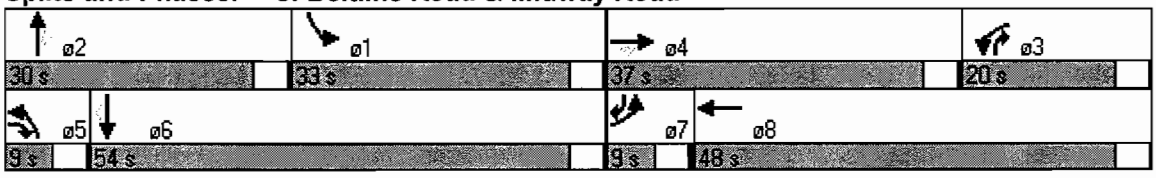
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	11	10	10	11	10	10	11	10	10	11	10
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	200		200	200		0	150		300	150		200
Storage Lanes	2		1	2		0	2		1	2		1
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Leading Detector (ft)	50	50	50	50	50		50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0		0	0	0	0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	0.97	0.91	1.00	0.97	0.91	0.91	0.97	0.91	1.00	0.97	0.91	1.00
Frt Protected			0.850		0.974				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3204	4916	1478	3204	4788	0	3204	4916	1478	3204	4916	1478
Frt Perm.			0.850		0.974				0.850			0.850
Flt Perm.	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3204	4916	1478	3204	4788	0	3204	4916	1478	3204	4916	1478
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			11		44				58			7
Headway Factor	1.09	1.04	1.09	1.09	1.04	1.09	1.09	1.04	1.09	1.09	1.04	1.09
Volume (vph)	140	1269	231	296	1277	273	120	706	212	376	1781	101
Confl. Peds. (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.85	0.85	0.85	0.90	0.90	0.90	0.88	0.88	0.88
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	152	1379	251	348	1502	321	133	784	236	427	2024	115
Lane Group Flow (vph)	152	1379	251	348	1823	0	133	784	236	427	2024	115
Turn Type	Prot		Pm+Ov	Prot			Prot		Pm+Ov	Prot		Pm+Ov
Protected Phases	7	4	5	3	8		5	2	3	1	6	7
Permitted Phases			4						2			6
Detector Phases	7	4	5	3	8		5	2	3	1	6	7
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	20.0	8.0	8.0	20.0		8.0	20.0	8.0	8.0	20.0	8.0
Total Split (s)	9.0	37.0	9.0	20.0	48.0	0.0	9.0	30.0	20.0	33.0	54.0	9.0
Total Split (%)	8%	31%	8%	17%	40%	0%	8%	25%	17%	28%	45%	8%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5
Lead/Lag	Lead	Lead	Lead	Lag	Lag		Lead	Lead	Lag	Lag	Lag	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	Max	Max	Max	Max	Max		Max	Max	Max	Max	Max	Max
Lane Grp Cap (vph)	160	1393	500	454	1823		160	1106	614	801	2089	743
v/s Ratio Prot	0.05	0.28	0.03	0.11	0.38		0.04	0.16	0.05	0.13	0.41	0.01
v/s Ratio Perm			0.14						0.10			0.07
Critical LG?		Yes			Yes		Yes				Yes	
Act Effct Green (s)	6.0	34.0	40.0	17.0	45.0		6.0	27.0	47.0	30.0	51.0	60.0

Lanes, Volumes, Timings

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio	0.05	0.28	0.33	0.14	0.38		0.05	0.23	0.39	0.25	0.43	0.50
v/c Ratio	0.95	0.99	0.50	0.77	1.00		0.83	0.71	0.38	0.53	0.97	0.15
Uniform Delay, d1	56.8	42.8	18.0	49.6	36.6		56.5	42.9	19.1	38.9	33.7	15.2
Platoon Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incr. Delay, d2	59.0	21.8	3.6	11.7	21.1		37.2	3.8	1.8	2.5	13.6	0.4
Webster Delay	115.8	64.7	21.5	61.3	57.7		93.7	46.7	20.9	41.5	47.3	15.6
Webster LOS	F	E	C	E	E		F	D	C	D	D	B
Queue Length 50th (ft)	61	390	102	135	503		53	206	96	148	551	43
Queue Length 95th (ft)	#130	#500	171	176	#562		#110	254	165	194	#645	77
Link Length (ft)		420			420			420			420	
50th Up Block Time (%)					10%						14%	
95th Up Block Time (%)		12%			15%						19%	
Turn Bay Length (ft)	200		200	200			150		300	150		200
50th Bay Block Time %		34%			37%			20%		2%	42%	
95th Bay Block Time %		44%			40%			31%		19%	44%	
Queuing Penalty (veh)		59			134			33		65	182	

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 48 (40%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 100
Control Type: Pretimed
Total Lost Time: 9
Sum of Critical v/s Ratios: 0.90
Intersection v/c Ratio: 0.97
Intersection Webster Signal Delay: 53.2
Intersection LOS: D
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Beltline Road & Midway Road



Lanes, Volumes, Timings

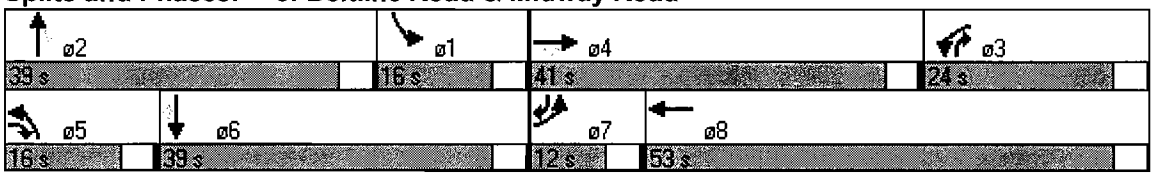
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	11	10	10	11	10	10	11	10	10	11	10
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	200		200	200		0	150		300	150		200
Storage Lanes	2		1	2		0	2		1	2		1
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Leading Detector (ft)	50	50	50	50	50		50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0		0	0	0	0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	0.97	0.91	1.00	0.97	0.91	0.91	0.97	0.91	1.00	0.97	0.91	1.00
Frt Protected			0.850		0.976				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3204	4916	1478	3204	4798	0	3204	4916	1478	3204	4916	1478
Frt Perm.			0.850		0.976				0.850			0.850
Flt Perm.	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3204	4916	1478	3204	4798	0	3204	4916	1478	3204	4916	1478
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			41		41				9			12
Headway Factor	1.09	1.04	1.09	1.09	1.04	1.09	1.09	1.04	1.09	1.09	1.04	1.09
Volume (vph)	203	1346	191	305	1554	303	258	1319	300	249	995	143
Confl. Peds. (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.96	0.96	0.96	0.97	0.97	0.97	0.84	0.84	0.84
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	214	1417	201	318	1619	316	266	1360	309	296	1185	170
Lane Group Flow (vph)	214	1417	201	318	1935	0	266	1360	309	296	1185	170
Turn Type	Prot		Pm+Ov	Prot			Prot		Pm+Ov	Prot		Pm+Ov
Protected Phases	7	4	5	3	8		5	2	3	1	6	7
Permitted Phases			4						2			6
Detector Phases	7	4	5	3	8		5	2	3	1	6	7
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	20.0	8.0	8.0	20.0		8.0	20.0	8.0	8.0	20.0	8.0
Total Split (s)	12.0	41.0	16.0	24.0	53.0	0.0	16.0	39.0	24.0	16.0	39.0	12.0
Total Split (%)	10%	34%	13%	20%	44%	0%	13%	33%	20%	13%	33%	10%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5
Lead/Lag	Lead	Lead	Lead	Lag	Lag		Lead	Lead	Lag	Lag	Lag	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	Max	Max	Max	Max	Max		Max	Max	Max	Max	Max	Max
Lane Grp Cap (vph)	240	1557	652	561	2023		347	1475	744	347	1475	598
v/s Ratio Prot	0.07	0.29	0.03	0.10	0.40		0.08	0.28	0.07	0.09	0.24	0.02
v/s Ratio Perm			0.10						0.14			0.09
Critical LG?		Yes			Yes			Yes			Yes	
Act Effct Green (s)	9.0	38.0	51.0	21.0	50.0		13.0	36.0	60.0	13.0	36.0	48.0

Lanes, Volumes, Timings

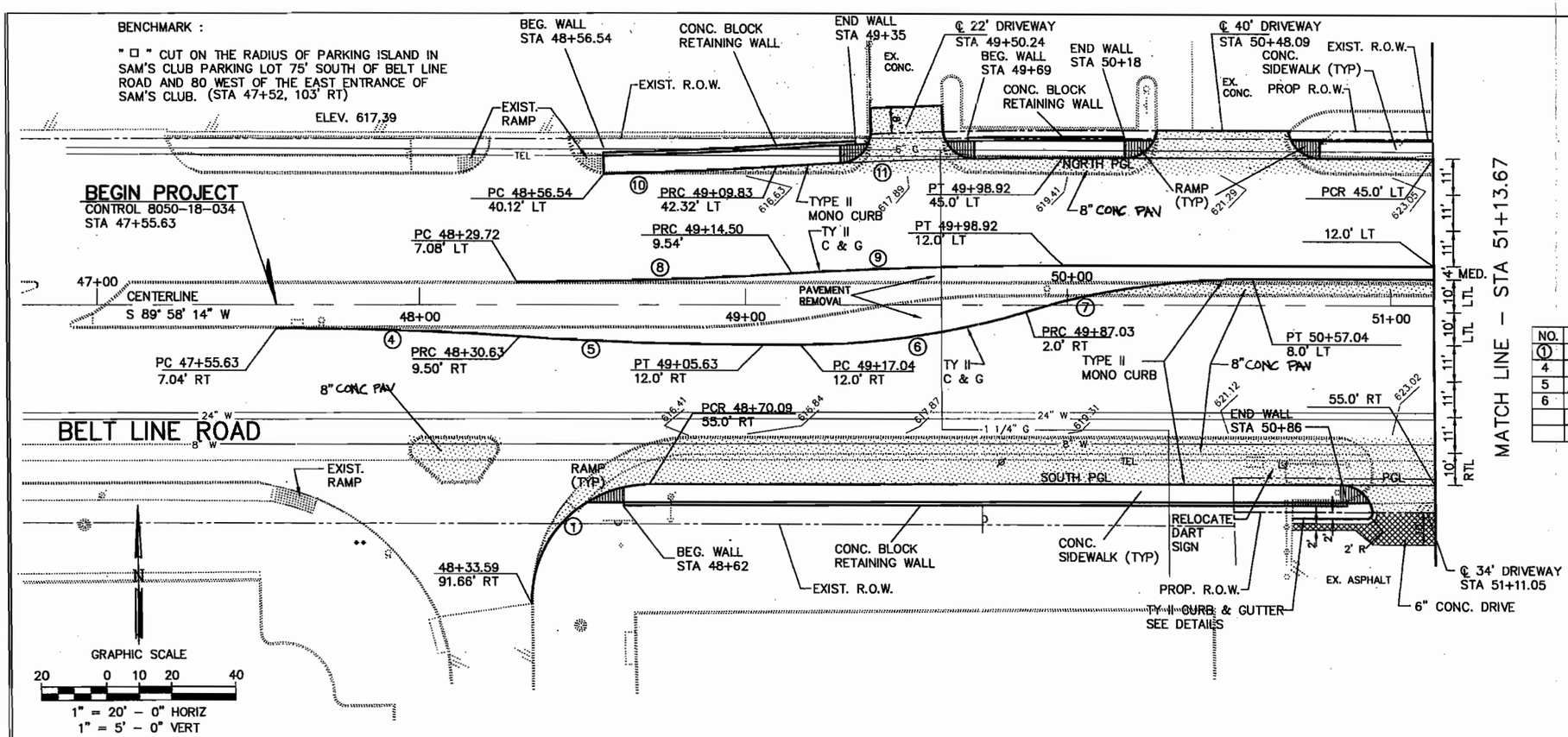
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio	0.08	0.32	0.43	0.18	0.42		0.11	0.30	0.50	0.11	0.30	0.40
v/c Ratio	0.89	0.91	0.31	0.57	0.96		0.77	0.92	0.42	0.85	0.80	0.28
Uniform Delay, d1	55.0	39.4	9.3	45.3	33.2		52.0	40.6	18.3	52.5	38.7	22.5
Platoon Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incr. Delay, d2	35.7	9.5	1.2	4.1	12.1		14.9	11.0	1.7	22.5	4.7	1.2
Webster Delay	90.6	48.8	10.5	49.4	45.3		66.9	51.6	20.0	75.0	43.4	23.7
Webster LOS	F	D	B	D	D		E	D	B	E	D	C
Queue Length 50th (ft)	86	384	45	117	516		105	373	142	118	309	81
Queue Length 95th (ft)	#158	#460	78	165	#634		#164	#463	215	#170	335	125
Link Length (ft)		420			420			420			420	
50th Up Block Time (%)					10%							
95th Up Block Time (%)		5%			20%			5%				
Turn Bay Length (ft)	200		200	200			150		300	150		200
50th Bay Block Time %		32%			35%			41%			35%	
95th Bay Block Time %		38%			40%		11%	47%		14%	38%	
Queuing Penalty (veh)		75			120		25	117		28	108	

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 16 (13%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 80
Control Type: Pretimed
Total Lost Time: 6
Sum of Critical v/s Ratios: 0.86
Intersection v/c Ratio: 0.90
Intersection Webster Signal Delay: 47.7
Intersection LOS: D
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Beltline Road & Midway Road



PAVING SHEETS



LEGEND :

PGL	PROFILE GRADE LINE
PC	POINT OF CURVATURE
PT	POINT OF TANGENCY
PRC	POINT OF REVERSE CURVE
PCC	POINT OF COMPOUND CURVE
PCR	POINT OF CURB RETURN
EX	EXISTING
RT	RIGHT
LT	LEFT

BARRIER FREE RAMP

PROP. NEW PAVEMENT

612.3 EX. SPOT GUTTER ELEV.

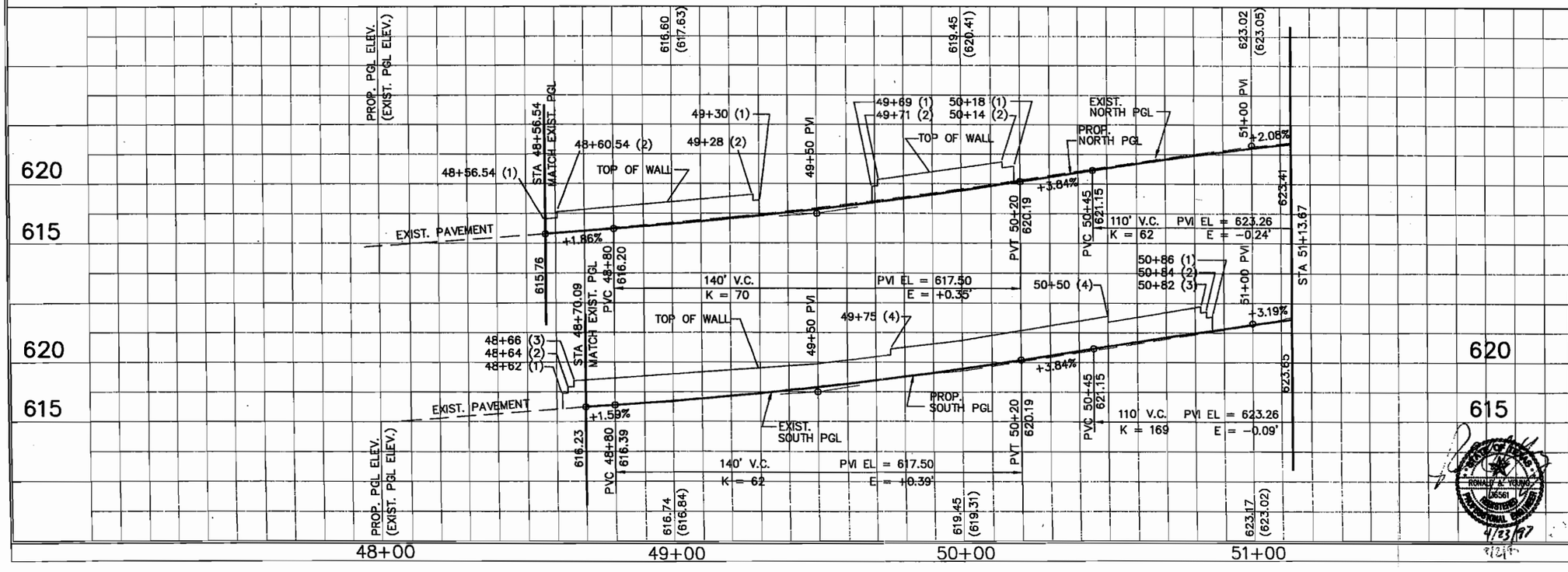
CURVE TABLE

NO.	DELTA	RADIUS	LENGTH
①	90° 14' 46"	36.5'	57.49'
4	03° 49' 06"	1126.25'	75.06'
5	03° 49' 06"	1126.25'	75.06'
6	16° 15' 37"	250.0'	70.95'

NO.	DELTA	RADIUS	LENGTH
7	16° 15' 37"	250.0'	70.95'
8	03° 21' 06"	1450.0'	84.82'
9	03° 20' 16"	1450.0'	84.47'
10	02° 09' 32"	1417.0'	53.39'
11	03° 26' 31"	1483.0'	89.09'

NOTES :

1. ALL DRIVEWAY RADII SHALL BE 15' UNLESS NOTED OTHERWISE.
2. BARRIER FREE RAMPS SHALL BE CONSTRUCTED AT ALL DRIVEWAYS AND STREET INTERSECTIONS. SEE PLANS FOR LOCATIONS.
3. SEE DRIVEWAY PROFILE PLAN FOR DRIVEWAY PROFILES.
4. FINAL LOCATIONS OF DART SIGNS SHALL BE AS DIRECTED BY THE ENGINEER AND SHALL BE PAID FOR UNDER ITEM 649.



⚠ Revised 8" CRCP to 8" conc pav. 9/2/97 BT

SHEET 1 OF 8

BARTON-ASCHMAN ASSOCIATES, INC.

PAVING AND DRAINAGE PLAN/PROFILE SHEET

BELT LINE ROAD
STA 47+55.63 TO STA 51+13.67
ADDISON, TEXAS

Texas Department of Transportation ©1999

DART

REVISION	DATE	FED. ROAD DIV. No.	FEDERAL AID PROJECT NO.		SHEET No.
		.6	CM 97 (449)		16
		STATE	STATE DIST.	COUNTY	
		TEXAS	DALLAS	DALLAS	
		CONT.	SECT.	JOB	HIGHWAY No.
DESIGNED BY: R.A.Y.		8050	18	034	BELT LINE RD
DRAWN BY: B.A.A.		BA FILE NAME :			
CHECKED BY: L.M.P.					

STATE OF TEXAS RONALD A. YOUNG 86561 REGISTERED PROFESSIONAL ENGINEER 4/23/97

MIDWAY ROAD — MATCHLINE STA 6+19.71

BELT LINE ROAD — MATCHLINE STA 51+13.67

MIDWAY ROAD — MATCHLINE STA 3+79.10

BELT LINE ROAD

MIDWAY ROAD

CURVE TABLE

NO.	DELTA	RADIUS	LENGTH
12	89° 36' 20"	40.0'	62.56'
13	90° 23' 40"	75.0'	118.33'
14	04° 27' 20"	900.0'	69.99'
15	08° 58' 31"	250.0'	39.16'
16	13° 12' 29"	250.0'	57.63'
17	16° 03' 33"	200.0'	56.06'
18	19° 06' 56"	250.0'	83.41'

NO.	DELTA	RADIUS	LENGTH
19	01° 54' 33"	1965.0'	65.48'
20	89° 29' 13"	75.0'	117.14'
21	89° 36' 20"	40.0'	62.56'
22	04° 25' 04"	1998.0'	154.06'
90	02° 01' 40"	900.0'	31.85'
91	04° 27' 20"	867.0'	67.42'
92	03° 30' 28"	933.0'	57.12'

LEGEND :

PGL	PROFILE GRADE LINE
PC	POINT OF CURVATURE
PT	POINT OF TANGENCY
PRC	POINT OF REVERSE CURVE
PCC	POINT OF COMPOUND CURVE
PCR	POINT OF CURB RETURN
EX	EXISTING
RT.	RIGHT
LT	LEFT
	BARRIER FREE RAMP
	PROP. NEW PAVEMENT

GRAPHIC SCALE
20 0 10 20 40
1" = 20' – 0" HORIZ
1" = 5' – 0" VERT

NOTES :
1. ALL DRIVEWAY RADII SHALL BE 15' UNLESS NOTED OTHERWISE.
2. BARRIER FREE RAMPS SHALL BE CONSTRUCTED AT ALL DRIVEWAYS AND STREET INTERSECTIONS. SEE PLANS FOR LOCATIONS.
3. SEE DRIVEWAY PROFILE PLAN FOR DRIVEWAY PROFILES.
4. FINAL LOCATIONS OF DART SIGNS SHALL BE AS DIRECTED BY THE ENGINEER AND SHALL BE PAID FOR UNDER ITEM 649.

BENCHMARK :
"□" CUT ON NORTHWEST CORNER OF PARKING LOT OF FINA STATION AT SOUTHWEST CORNER OF MIDWAY AND BELT LINE ROAD.
(STA 50+69, 60' RT)
ELEV. 624.32

⚠ REVISED 8" CPCD to 8" CONC PAV 9/2/97 RT

SHEET 2 OF 8

BARTON-ASCHMAN ASSOCIATES, INC.

PAVING AND DRAINAGE PLAN/PROFILE SHEET
BELT LINE ROAD
STA 51+13.67 TO STA 56+81.18
ADDISON, TEXAS

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DART

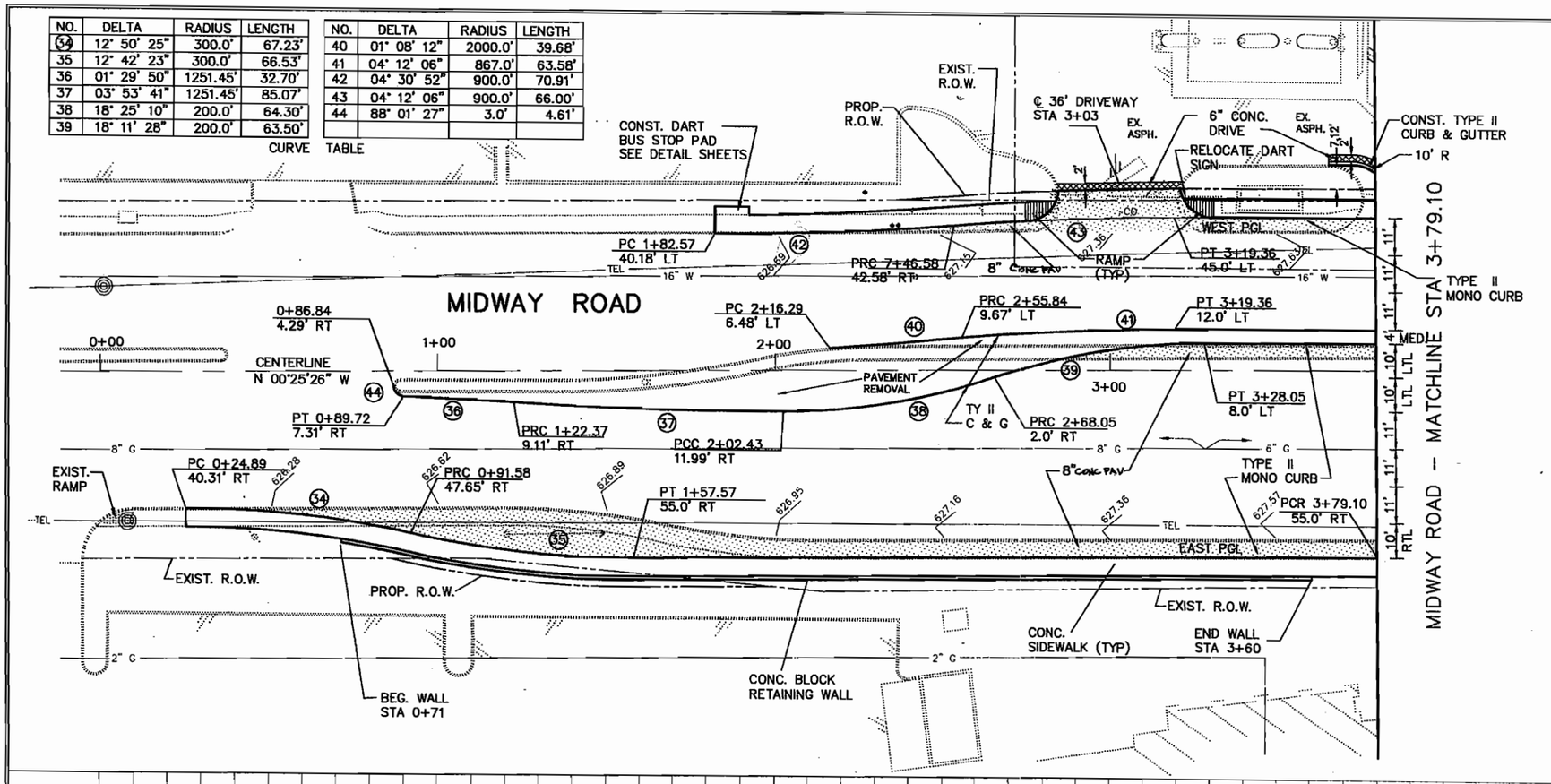
REVISION	DATE	FED. ROAD DIV. No.	FEDERAL AID PROJECT NO.	SHEET No.
		6	CM 97 (449)	17
		STATE	STATE DIST.	COUNTY
		TEXAS	DALLAS	DALLAS
		CONT.	SECT.	JOB	HIGHWAY No.
DESIGNED BY: R.A.Y.		8050	18	034	BELT LINE RD.
DRAWN BY: B.A.A.					
CHECKED BY: L.M.P.		BA FILE NAME :			

RONALD A. YOUNG 3665 REGISTERED PROFESSIONAL ENGINEER 4/23/97 9/2/97

NO.	DELTA	RADIUS	LENGTH
34	12° 50' 25"	300.0'	67.23'
35	12° 42' 23"	300.0'	66.53'
36	01° 29' 50"	1251.45'	32.70'
37	03° 53' 41"	1251.45'	85.07'
38	18° 25' 10"	200.0'	64.30'
39	18° 11' 28"	200.0'	63.50'

CURVE TABLE

NO.	DELTA	RADIUS	LENGTH
40	01° 08' 12"	2000.0'	39.68'
41	04° 12' 06"	867.0'	63.58'
42	04° 30' 52"	900.0'	70.91'
43	04° 12' 06"	900.0'	66.00'
44	88° 01' 27"	3.0'	4.61'



GRAPHIC SCALE

20 0 10 20 40

1" = 20' – 0" HORIZ
1" = 5' – 0" VERT

BENCHMARK :
"□" CUT ON NORTHWEST CORNER OF PARKING LOT OF FINA STATION AT SOUTHWEST CORNER OF MIDWAY AND BELT LINE ROAD.

ELEV. 624.32

LEGEND :

PGL	PROFILE GRADE LINE
PC	POINT OF CURVATURE
PT	POINT OF TANGENCY
PRC	POINT OF REVERSE CURVE
PCC	POINT OF COMPOUND CURVE
PCR	POINT OF CURB RETURN
EX	EXISTING
RT	RIGHT
LT	LEFT

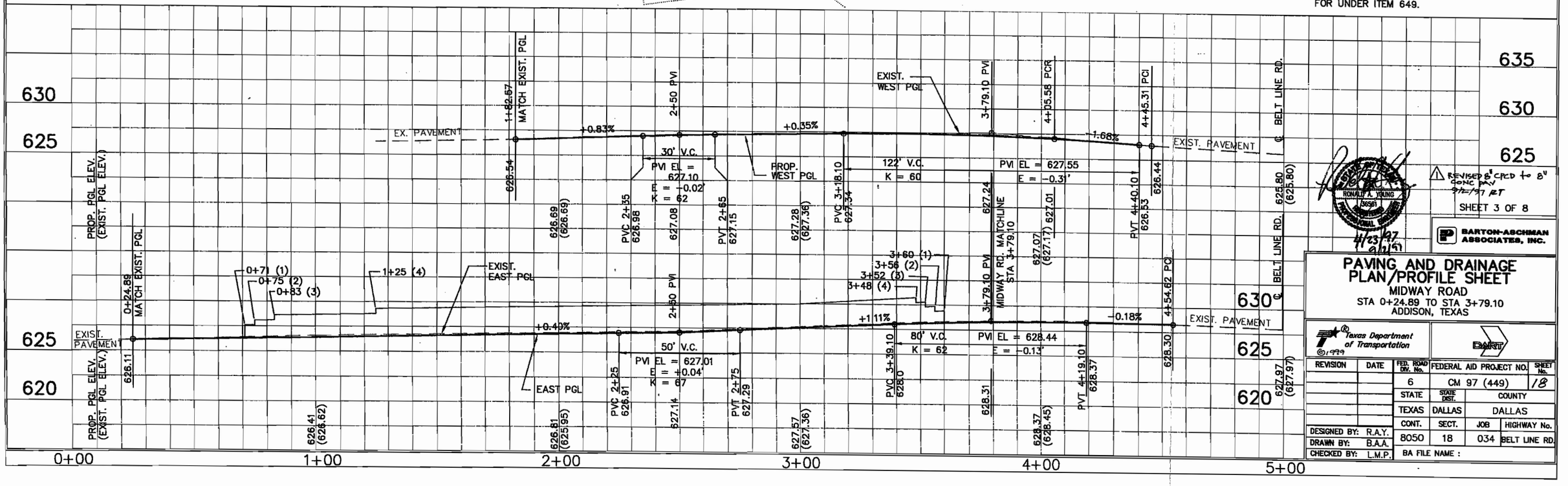
BARRIER FREE RAMP

PROP. NEW PAVEMENT

612.3 EX. SPOT GUTTER ELEV.

NOTES :

1. ALL DRIVEWAY RADII SHALL BE 15' UNLESS NOTED OTHERWISE.
2. BARRIER FREE RAMPS SHALL BE CONSTRUCTED AT ALL DRIVEWAYS AND STREET INTERSECTIONS. SEE PLANS FOR LOCATIONS.
3. SEE DRIVEWAY PROFILE PLAN FOR DRIVEWAY PROFILES.
4. FINAL LOCATIONS OF DART SIGNS SHALL BE AS DIRECTED BY THE ENGINEER AND SHALL BE PAID FOR UNDER ITEM 649.



⚠ REVISED 8" CRCD to 8" CONC PAV 5/2/97 RT

SHEET 3 OF 8

BARTON-ASCHMAN ASSOCIATES, INC.

PAVING AND DRAINAGE PLAN/PROFILE SHEET

MIDWAY ROAD
STA 0+24.89 TO STA 3+79.10
ADDISON, TEXAS

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DART

REVISION	DATE	FED. ROAD DIV. No.	FEDERAL AID PROJECT NO.	SHEET No.
		6	CM 97 (449)	18
		STATE	STATE DIST.	COUNTY
		TEXAS	DALLAS	DALLAS
		CONT.	SECT.	JOB	HIGHWAY No.
DESIGNED BY: R.A.Y.		8050	18	034	BELT LINE RD.
DRAWN BY: B.A.A.					
CHECKED BY: L.M.P.		BA FILE NAME :			

BENCHMARK :
"□" CUT ON NORTHWEST CORNER OF PARKING LOT OF FINA STATION AT SOUTHWEST CORNER OF MIDWAY AND BELT LINE ROAD.
(BELT LINE STA 50+69, 60' RT) ELEV. 624.32

LEGEND :

PI	POINT OF INTERSECTION
PGL	PROFILE GRADE LINE
PC	POINT OF CURVATURE
PT	POINT OF TANGENCY
PRC	POINT OF REVERSE CURVE
PCC	POINT OF COMPOUND CURVE
PCR	POINT OF CURB RETURN
EX	EXISTING
RT	RIGHT
LT	LEFT

BARRIER FREE RAMP

PROP. NEW PAVEMENT

612.3 EX. SPOT GUTTER ELEV.

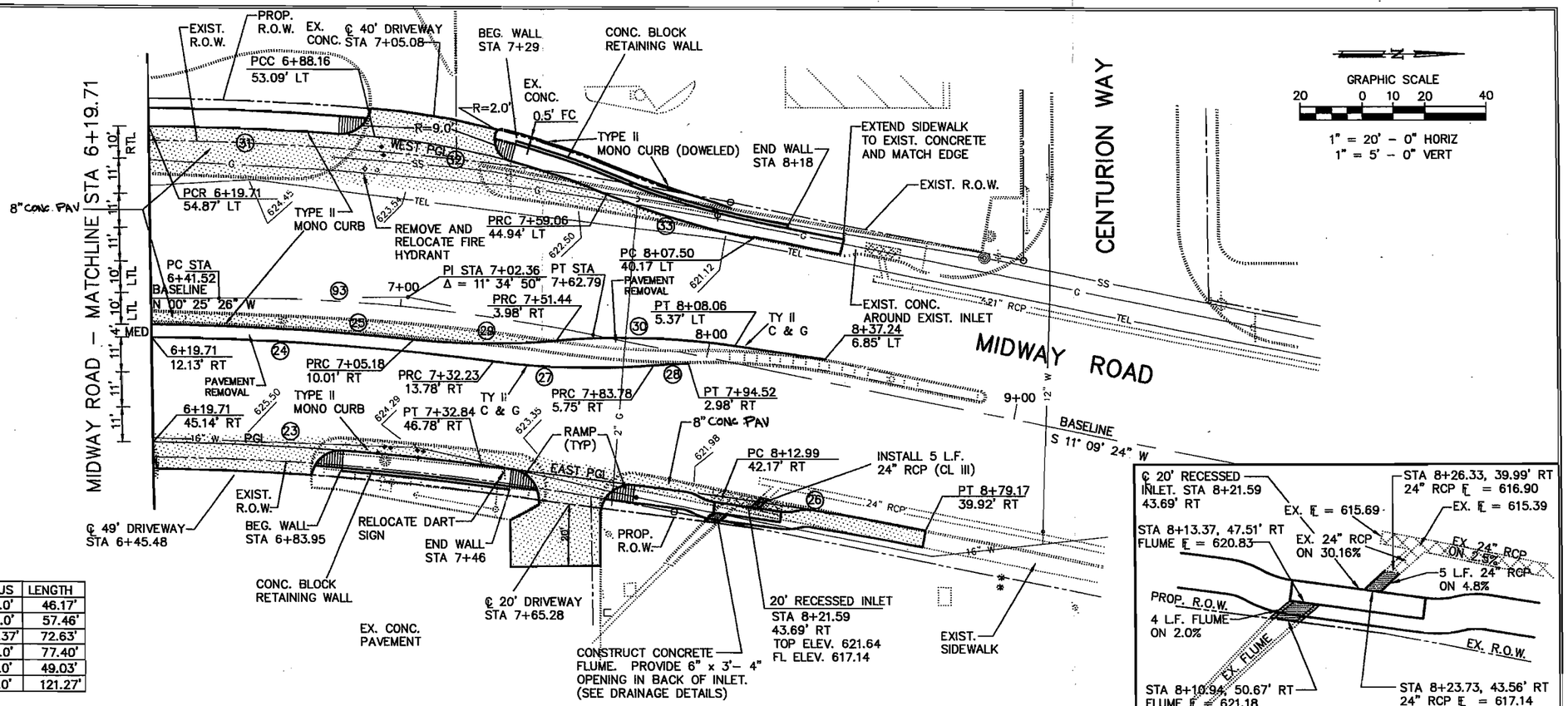
NOTES :

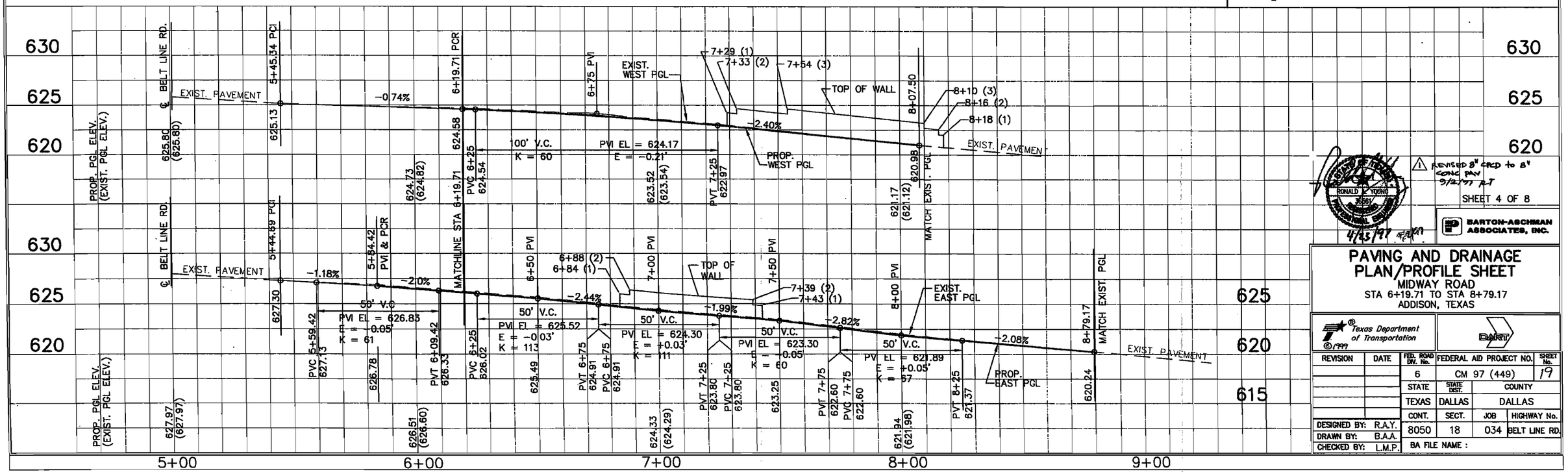
1. ALL DRIVEWAY RADII SHALL BE 15' UNLESS NOTED OTHERWISE.
2. BARRIER FREE RAMPS SHALL BE CONSTRUCTED AT ALL DRIVEWAYS AND STREET INTERSECTIONS. SEE PLANS FOR LOCATIONS.
3. SEE DRIVEWAY PROFILE PLAN FOR DRIVEWAY PROFILES.
4. FINAL LOCATIONS OF DART SIGNS SHALL BE AS DIRECTED BY THE ENGINEER AND SHALL BE PAID FOR UNDER ITEM 649.

CURVE TABLE

NO.	DELTA	RADIUS	LENGTH
23	07° 46' 17"	909.37'	123.34'
24	07° 46' 17"	942.37'	127.82'
25	06° 09' 52"	946.37'	101.82'
26	03° 53' 31"	975.0'	66.23'
27	11° 50' 38"	250.0'	51.68'
28	02° 32' 37"	250.0'	11.10'

NO.	DELTA	RADIUS	LENGTH
29	10° 34' 55"	250.0'	46.17'
30	13° 10' 08"	250.0'	57.46'
31	04° 07' 22"	1009.37'	72.63'
32	17° 44' 17"	250.0'	77.40'
33	11° 14' 16"	250.0'	49.03'
93	11° 34' 50"	600.0'	121.27'





1 REVISED 8" CRCP to 8" CONC PAV 9/2/97 R.T

SHEET 4 OF 8

BARTON-ASCHMAN ASSOCIATES, INC.

PAVING AND DRAINAGE PLAN/PROFILE SHEET

MIDWAY ROAD
STA 6+19.71 TO STA 8+79.17
ADDISON, TEXAS

Texas Department of Transportation ©1999

DART

REVISION	DATE

FED. ROAD DIV. No.	FEDERAL AID PROJECT NO.	SHEET No.
6	CM 97 (449)	19

STATE	STATE DIST.	COUNTY
TEXAS	DALLAS	DALLAS

CONT.	SECT.	JOB	HIGHWAY No.
8050	18	034	BELT LINE RD.

DESIGNED BY: R.A.Y.
DRAWN BY: B.A.A.
CHECKED BY: L.M.P.
BA FILE NAME :