ARAPAHO II/III SECOND OPINION

Oxford®

NO. 753 1/3

ESSELTE

10%

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DALLAS, TEXAS 75287
972•248•3006 FAX 972•248•3855

LEE ENGINEERING

October 12, 2000

Mr. Jim C. Pierce, P.E.
Assistant City Engineer
Town of Addison
16801 Westgrove Drive
Addison, Texas 75001-9010

Re: Arapaho Road Alignment/Access Study Review

Dear Mr. Pierce:

Per your request, Lee Engineering has performed a review of the Alignment Study Report for Proposed Arapaho Road Extension prepared by HNTB. The recommended configuration of Arapaho Road from the HNTB report includes an overpass over Midway Road with no connection provided for traffic to interchange between Arapaho Road and Midway Road. The primary purpose of this review was to identify connection alternatives and determine if a connection between Arapaho Road and Midway Road would be practical and would allow the Arapaho extension to be more fully utilized.

Based on our review, a connection would increase the utilization of the Arapaho extension. The connection would also impact local properties and could negatively impact traffic operations along Midway Road in the area.

STUDY APPROACH

In reviewing the Alignment Study and the recommended configuration for Arapaho Road the following key steps were taken:

1. Reviewed study reports,
2. Reviewed background data,
3. Collected additional data as needed,
4. Identified and assigned potential diverted trips,
5. Analyzed operations with connections,
6. Eliminated connection alternatives that would negatively impact traffic operations,
7. Estimated total diversions of acceptable movements, and
8. Evaluated alternative connection configurations,

This approach was somewhat iterative as total diversions were first estimated and then individual movements were eliminated as connection alternatives were determined to be impractical.

PREVIOUS REPORTS

As a part of the previous study conducted for this interchange, traffic projections for the Arapaho Road extension were made based on travel demand model runs completed by the North Central Texas Council of Governments (NCTCOG). These projections indicate that without any connection between Arapaho Road and Midway Road the Arapaho extension is expected to carry 13,000 vehicles per day. With the various connection alternatives considered the NCTCOG projection ranged from 6,000 to 28,000 vehicles per day. It was assumed in conducting the analysis that the projected volume of 13,000 vehicles per day on the Arapaho extension developed by NCTCOG with no connection to Midway Road is reliable.

The underlying data provided by NCTCOG for the various connection alternative was reviewed. We determined that a better estimate of future traffic volumes on the Arapaho Road extension with some form of connection in place could be made by reviewing existing count data at area intersections. This review would focus on turning movement volumes that would potentially use the connections provided.

DATA COLLECTION

A data collection plan was devised in an effort to better estimate the number of trips that would be diverted to the Arapaho extension. The area roadway network and area intersections were reviewed to determine the paths from which traffic could be expected to utilize a connection at Midway to divert to the new Arapaho extension. Peak period turning movement counts were collected at the intersections of Beltline at Midway and Beltline at Marsh. These counts and the area roadway network are presented in Figures 1A, 1B, and 1C. This sampling of area intersections served as a basis for estimating diverted traffic volumes.

POTENTIAL DIVERTED TRIPS

Estimates were made of the percentages of existing turning movements from adjacent intersections that could be diverted to the new Arapaho Road extension if all possible movements were accommodated in the connection. These percentages, summarized in Table 1, were reviewed with Town staff for concurrence.

The percentages were then applied to the existing volumes to generate estimates of trips that could potentially be diverted if a connection were provided at Arapaho Road and Midway Road. These estimates and the resulting total intersection volumes for the potential interchange of Arapaho Road and Midway Road are shown on the schematic drawing of the interchange in Figures 2A, 2B, and 2C.

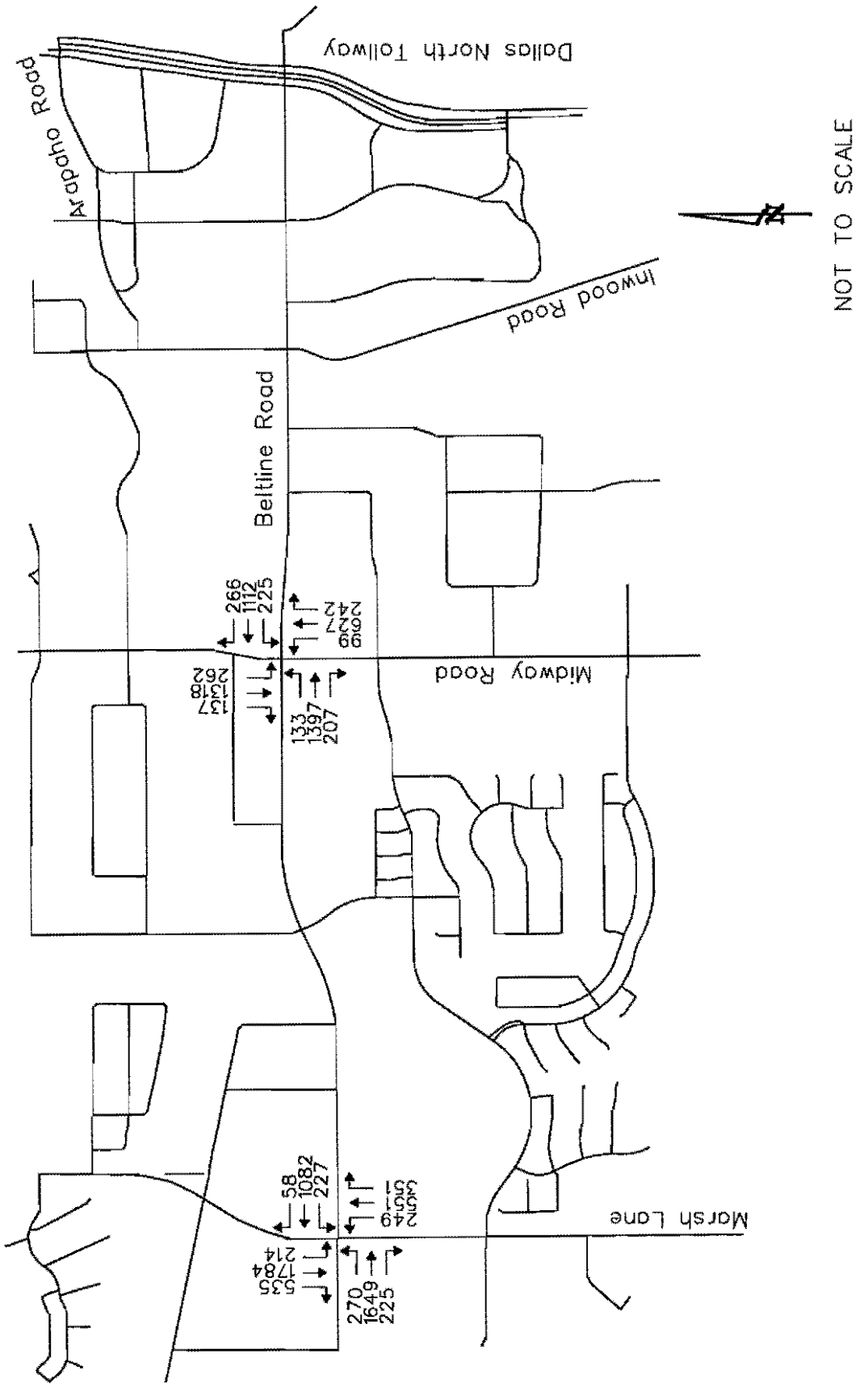


Figure 1A

Beltline at Midway and Marsh
Intersection Volumes (AM Peak Hour)

LEE ENGINEERING

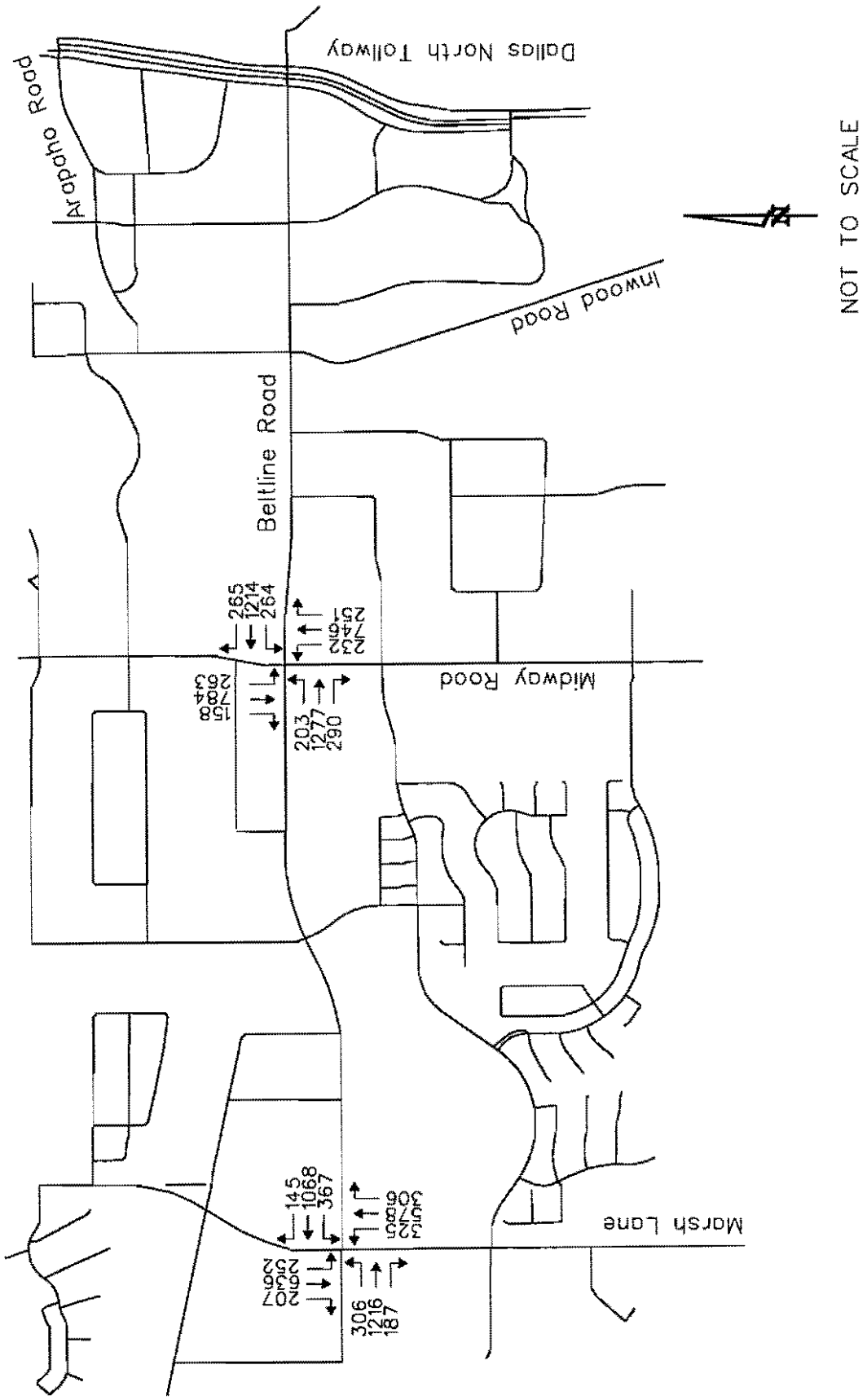


Figure 1B

Beltline at Midway and Marsh
Intersection Volumes (Noon Peak Hour)

ENGINEERING

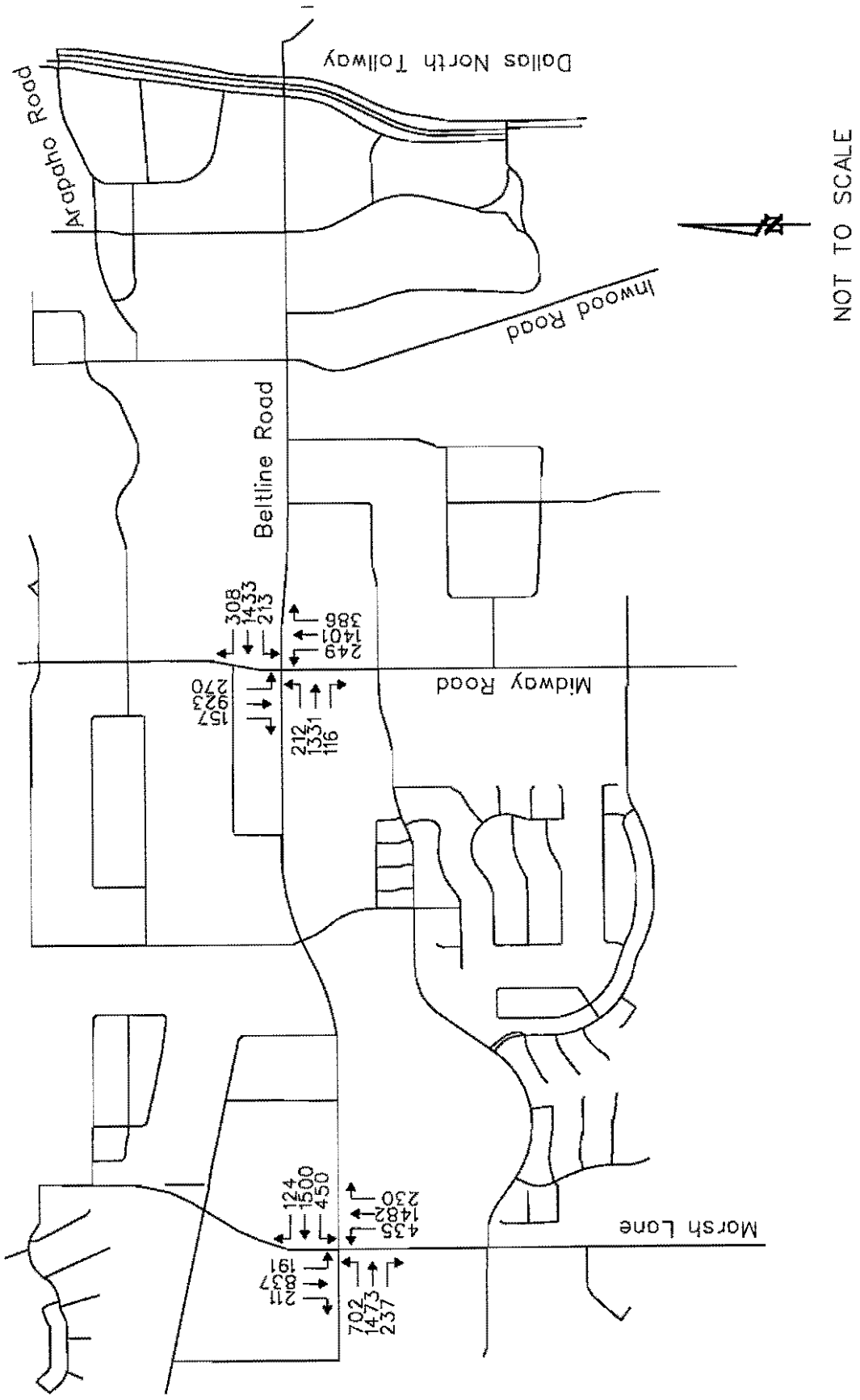


Figure 1C

Beltline at Midway and Marsh
Intersection Volumes (PM Peak Hour)

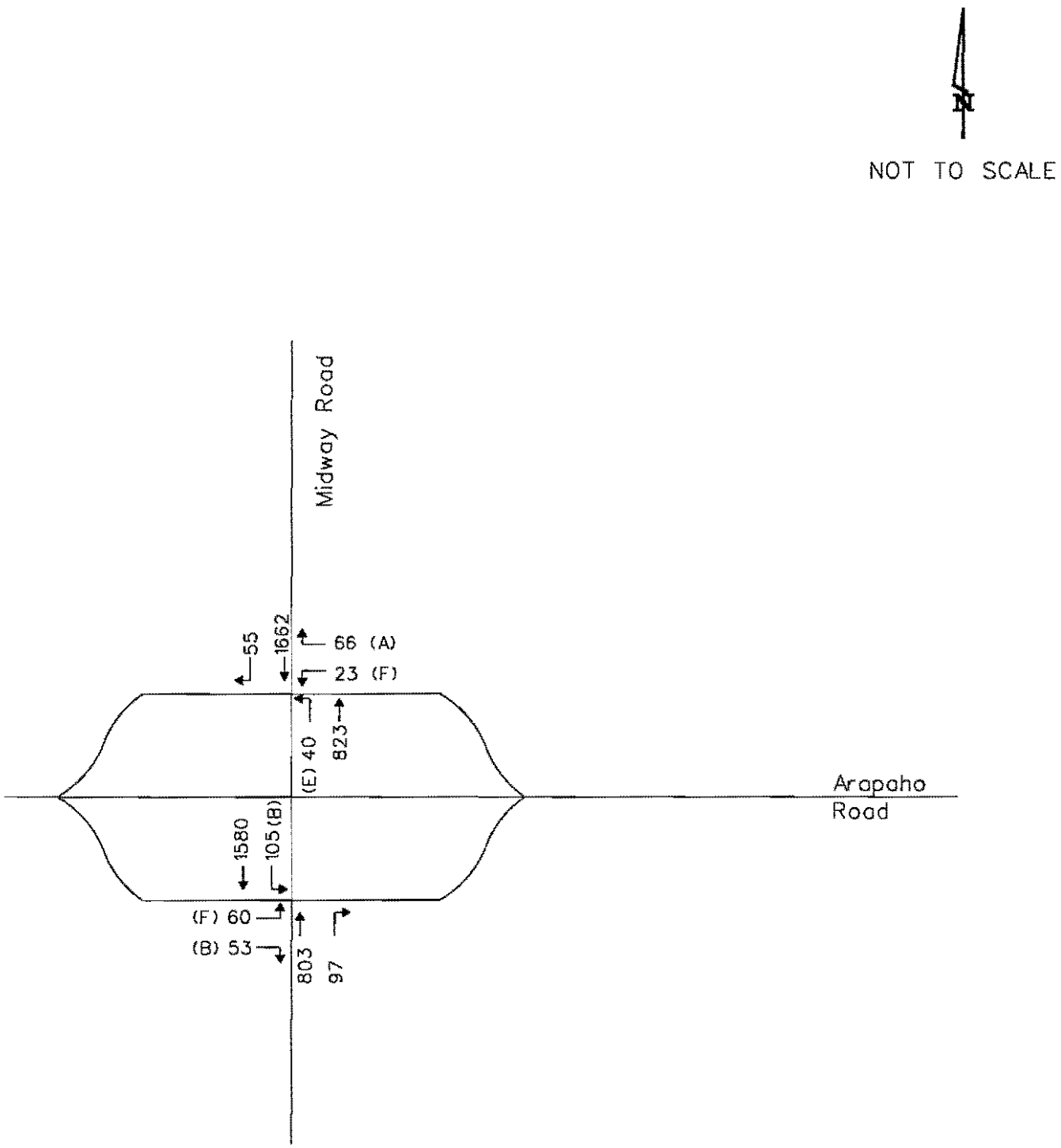


Figure 2A

Arapaho/Midway Intersection with Ramps (AM Peak Hour)

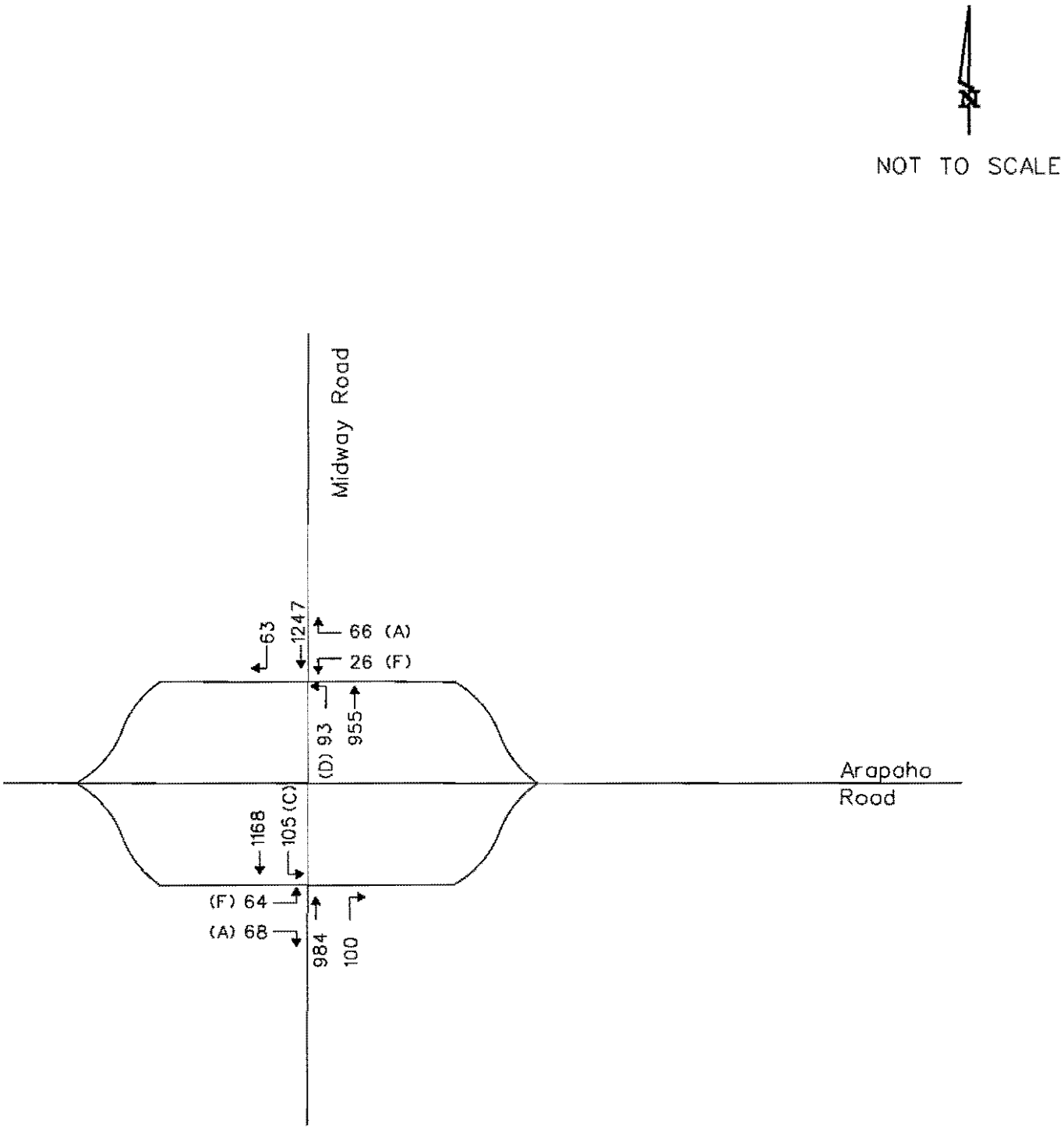
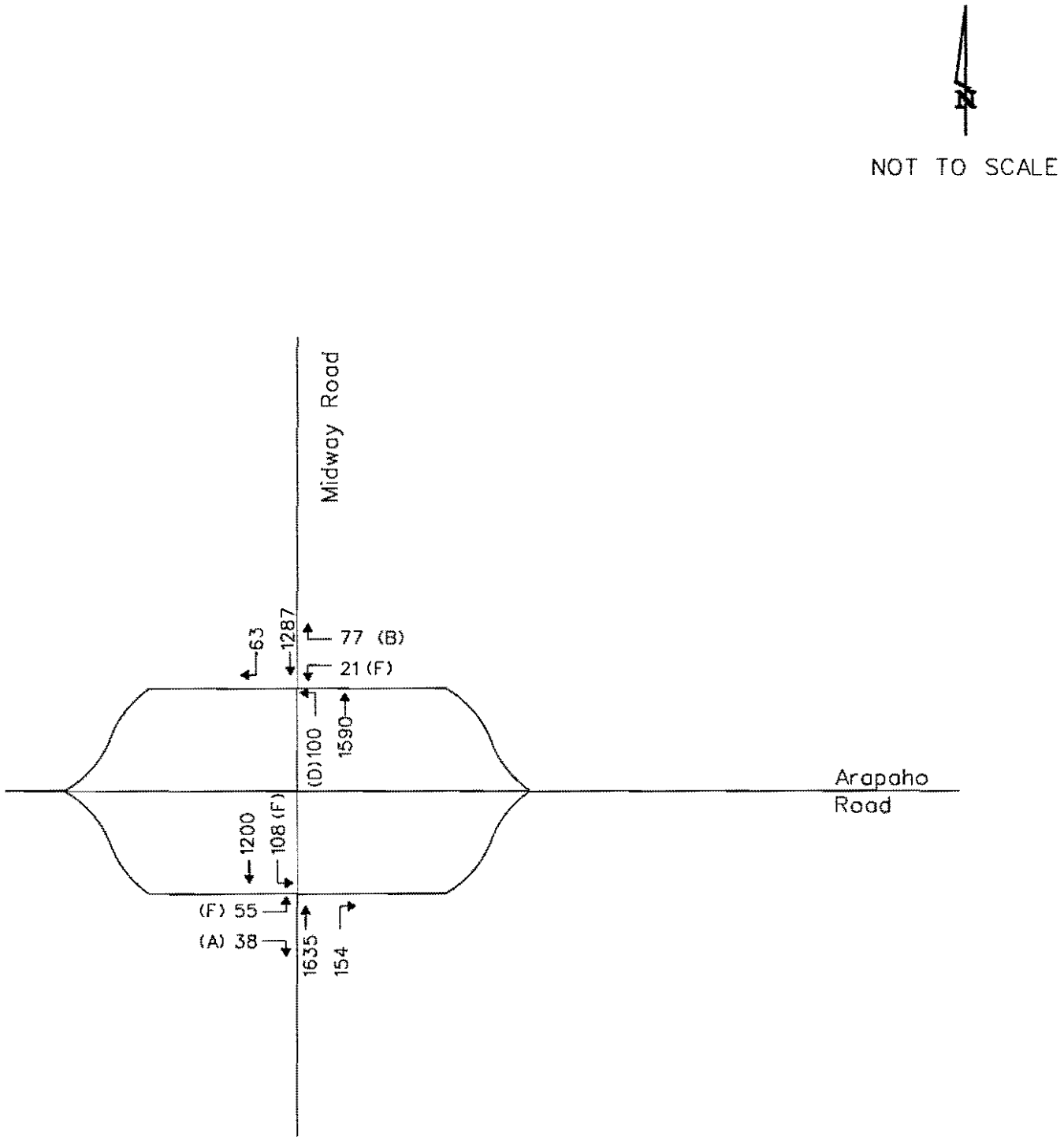


Figure 2B

Arapaho/Midway Intersection
with Ramps (Noon Peak Hour)



XX - Estimated Volumes
(A) - Level of Service

Figure 2C

Arapaho/Midway Intersection
with Ramps (PM Peak Hour)

LSC ENGINEERING

Table 1. Turning Movement Diversions

Existing Movement	Movement Diverted To	Percentage Diverted
Southbound Right turn at Midway/Beltline	Southbound Right turn at Midway/Arapaho	40
Southbound Left turn at Midway/Beltline	Southbound Left turn at Midway/Arapaho	40
Eastbound Left turn at Midway/Beltline and Northbound Right turn at Marsh/Beltline	Eastbound Left turn at Midway/Arapaho	25
Northbound Left turn at Midway/Beltline	Northbound Left turn at Midway/Arapaho	40
Northbound Right turn at Midway/Beltline	Northbound Right turn at Midway/Arapaho	40
Westbound Left turn at Midway/Beltline	Westbound Left turn at Midway/Arapaho	10
Eastbound Right turn at Midway/Beltline and Southbound Left turn at Marsh/Beltline	Eastbound Right turn at Midway/Arapaho	25
Westbound Right turn at Midway/Beltline	Westbound Right turn at Midway/Arapaho	25

INTERSECTION OPERATIONS

Two primary alternative configurations were tested. One alternative included an at-grade intersection between Arapaho Road and Midway Road. The other alternative included a grade separation and ramps extending from Arapaho Road to intersect with Midway Road.

At-grade intersection

The first alternative tested was an at-grade intersection connection between Arapaho Road and Midway Road. This intersection was assumed to be signalized and coordinated with the existing signal at Beltline Road at Midway Road. Analyses were conducted for existing conditions, conditions with the currently proposed grade separation, and for an at-grade intersection between Arapaho and Midway. The results of these analyses are summarized in Table 2.

Table 2. At-grade Intersection Operations

Intersection/Peak Hour	Existing Conditions	With Grade Separation	With At-grade Connection
Beltline at Midway	Level of Service (Total Vehicle Delay)		
AM	D (66 veh-hrs)	D (55 veh-hrs)	C (42 veh-hrs)
Noon	D (60 veh-hrs)	D (55 veh-hrs)	D (47 veh-hrs)
PM	E (120 veh-hrs)	D (70 veh-hrs)	D (67 veh-hrs)
Arapaho at Midway			
AM	N/A	N/A	C (32 veh-hrs)
Noon	N/A	N/A	C (30 veh-hrs)
PM	N/A	N/A	C (45 veh-hrs)

After reviewing these analyses it was determined that while the intersections would operate at acceptable levels of service, providing an at-grade intersection with a traffic signal at this location would have a significant impact on total system delay and travel times on Midway Road and on the Arapaho Road extension.

As can be seen, delays at the Beltline/Midway intersection will be reduced under either alternative. This is due to the reduction in through traffic on Beltline Road. As can also be seen, the total system delay would increase significantly with the addition of the signalized intersection of Arapaho at Midway. Total system delays obtained by adding the total delays at each intersection would increase from 55 vehicle-hours per hour to 74 vehicle-hours per hour in the AM peak, from 55 to 77 in the noon peak, and from 70 to 112 in the PM peak

A review of delays to individual movements showed that during the time periods analyzed, the at-grade connection with a signal would have minimal impacts on travel times for southbound Midway; however, northbound Midway travel times would be increased by as much as 21 seconds per vehicle.

Further review revealed that travel times on eastbound Arapaho for vehicles traveling from Marsh Lane to Addison Road during the hours analyzed would increase from approximately 130 seconds to between 146 and 162 seconds. This represents an increase of between 19 and 24 percent. Westbound travel times would increase by between 22 and 38 seconds.

A summary of the measures of effectiveness calculated in this analysis is presented in a table attached to this letter. These measures of effectiveness include total stops, fuel consumption, and vehicle emissions. As can be seen, all of these measures for the grade separation alternative are significantly better than the at-grade intersection alternative.

Another complication that would effect a signalized intersection of Arapaho and Midway is the proximity of the rail road tracks. Any time a train crosses Midway, the signal at Arapaho would be preempted and coordination along Midway between Arapaho and Beltline would be interrupted.

Grade Separation with Signalized Ramp Connections

The grade separated alternative was first tested with the ramp intersections with Midway controlled by traffic signals. Projected traffic volumes at these intersections shown in figures 2A, 2B, and 2C were used in this analysis. Signal timing plans were developed for the two intersections to provide coordinated operations with the existing signal at Beltline at Midway. The results of these analyses are summarized in Table 3. Again these results were compared to existing conditions and conditions with a grade separation and no connections to Midway.

As can be seen, operations at each of the intersection will be at acceptable levels of service. The additional total system delay (the sum of the total delay at each intersection) introduced by the addition of the signalized ramp connections is 16, 13, and 24 vehicle hours in the AM, Noon and PM peak hours respectively. The signal control will significantly delay the ramp movements. To maintain some level of progression on Midway, the phase time for the ramp connections was limited to 20 seconds out of the 120 second cycle. This will adequately serve the ramp volumes, but will also require some ramp traffic to stop and wait up to 100 seconds for a green indication.

Table 3. Signalized Ramp Connection Operations

Intersection/Peak Hour	Existing Conditions	With Grade Separation	With Signalized Ramp Connections
Beltline at Midway	Level of Service (Total Vehicle Delay)		
AM	D (66 veh-hrs)	D (55 veh-hrs)	C (43 veh-hrs)
Noon	D (60 veh-hrs)	D (55 veh-hrs)	C (46 veh-hrs)
PM	E (120 veh-hrs)	D (70 veh-hrs)	D (66 veh-hrs)
Eastbound Arapaho at Midway			
AM	N/A	N/A	B (11 veh-hrs)
Noon	N/A	N/A	B (9 veh-hrs)
PM	N/A	N/A	B (10 veh-hrs)
Westbound Arapaho at Midway			
AM	N/A	N/A	C (17 veh-hrs)
Noon	N/A	N/A	C (13 veh-hrs)
PM	N/A	N/A	C (18 veh-hrs)

Queue lengths were also reviewed under the signalized ramp connection scenario. This review revealed that the southbound queue in the AM peak hour was found to be the most critical. Southbound queues in the AM peak hour average over 450 feet in length with peak queue lengths of over 500 feet. The eastbound ramps will intersect Midway approximately 650 feet north of Beltline Road. While the queue does not exceed the storage available, this level of queuing from the Beltline intersection may interfere with operations at the ramp connections. Continuing traffic volume growth in the future may also result in longer queues.

A summary of the measures of effectiveness calculated in this analysis is also presented in a table attached to this letter. Again, these measures of effectiveness include total stops, fuel consumption, and vehicle emissions. These measures for the grade separation alternative without connections are better than the signalized connection alternative.

Another complication that would effect the signalized connections between Arapaho and Midway is the proximity of the rail road tracks. Any time a train crosses Midway, the signals at the Arapaho connections would be preempted and coordination would be interrupted.

Grade Separation with Unsignalized Ramp Connections

The other grade separation alternative tested utilized unsignalized ramp connections to Midway. Capacity analyses were conducted for each intersection using the Highway Capacity Software. The results of these analyses are presented in Figures 2A, 2B, and 2C and are summarized in Table 4.

Table 4. Capacity Analysis Results

Intersection	Movement	Level of Service		
		AM Peak	Noon Peak	PM peak
Midway at Westbound Ramps	Westbound Right	A	A	B
	Westbound Left	F	F	F
	Northbound Left	E	D	D
Midway at Eastbound Ramps	Eastbound Right	B	A	A
	Eastbound Left	F	F	F
	Southbound Left	B	C	F

As can be seen, several movements would operate at unacceptable levels of service (E or F). In an effort to ensure efficient traffic operations on Midway, those movements that are projected to operate at unacceptable levels of service were assumed to be prohibited. Intersection volumes were then adjusted to reflect the prohibition of these movements. The intersections were analyzed with the adjusted volumes to ensure that all movements would operate at acceptable levels of service. These analyses confirmed that the movements that would be allowed would operate at levels of service D of better.

TOTAL DIVERSIONS

After determining which movements could and could not be accommodated at an interchange of Arapaho Road and Midway Road, total daily diverted traffic volumes were estimated. This was accomplished by averaging the peak hour diverted volumes and assuming that this average peak hour represented an industry average of 10 percent of the daily volume on the roadway.

With the signalized alternatives, either at-grade or with the grade separation, all movements were assumed to be allowed, and the total potential additional traffic on the Arapaho Road extension west of Midway Road would be 2,500 vehicles per day and 3,160 vehicles per day east of Midway Road. These numbers represent increases of 19 and 24 percent over the projected traffic volumes on Arapaho Road without an interchange.

With an unsignalized connection several movements would be prohibited and the results of these calculations showed total potential additional traffic on the Arapaho Road extension west of Midway Road would be 1,130 vehicles per day and 1,870 vehicles per day east of Midway Road. These numbers represent increases of nine and 14 percent over the projected traffic volumes on Arapaho Road without an interchange.

IMPACT OF CONNECTIONS

The ramps required to complete the connections between the Arapaho Extension and Midway Road will have a significant impact on adjacent properties. Based on our preliminary review, these ramps would require the taking of the Charter Furniture building in the southwest quadrant of the intersection. The ramps would also take more parking area from the property on the southeast corner and eliminate the potential for providing parking for the property under the overpass structure. Preliminary schematic plans for these ramps have been prepared by HNTB.

Due to the impact of these ramps, alternative connections were explored. One potential connection would utilize an open piece of property west of Midway to provide a connection between Centurion and the Arapaho extension. Upon further examination, it was discovered that this connection would only provide for eastbound and westbound to southbound and southbound to eastbound and westbound connections efficiently. This alternate connection would result in only 1,130 diverted vehicles per day west of Midway and 1,290 vehicles per day east of Midway. It was also discovered that Arapaho Road would still be on a retaining wall structure at this location, thus making this connection more difficult to provide.

CONCLUSIONS AND RECOMMENDATIONS

A connection could be made between the Arapaho Road extension and Midway Road and would result in an increased utilization of Arapaho Road of between 15 and 25 percent. This represents a diversion off of Beltline Road of between 4 and 6 percent.

The following general observations are also made:

- An at-grade connection would significantly impact traffic operations on Midway and on Arapaho.
- Signalized connections with the grade separation would allow full utilization of the interchange, but would increase system wide delays and would significantly delay ramp traffic.
- With the grade separation, unsignalized connections would have the least impact on traffic along Midway, but would also not allow as much traffic to utilize the interchange as compared to the signalized alternatives.

If you have any questions, please contact me at (972) 248-3006. We appreciate the opportunity to provide these services.

Sincerely,

Joseph T. Short, P.E.
Office Manager

AGENDA

SPECIAL MEETING OF THE CITY COUNCIL

November 13, 2000

6:30 P.M.

ADDISON CONFERENCE CENTRE

(STONE COTTAGE)

15650 ADDISON ROAD

REGULAR SESSION

Item #R1 - Consideration of a Resolution reaffirming the approval of the technically preferred alignment for the Arapaho Road Extension.

Attachments:

Approved

1. Memo from Mike Murphy, Director of Public Works
2. Arapaho Road Alignment/Access Study Review, Jody Short, Lee Engineering
3. HTNB report

Administrative Recommendation:

Administration recommends approval.

WORK SESSION

Item #WS1 - Discussion of the Addison Road widening project.

Item #WS2 - Discussion of the Building Code to be considered for adoption at the November 14, 2000, Regular Meeting of the Addison City Council.

Item #WS3 - Discussion regarding the completion of the residential structure at 14832 Winnwood Road.

Item #WS4 - Discussion of the Fire Code to be considered for adoption at the November 14, 2000, Regular Meeting of the Addison City Council.

Item #WS5 - Discussion of valet parking, delivery vehicle parking, and the valet ordinance to be considered for adoption at the November 14, 2000, Regular Meeting of the Addison City Council.

Item #WS6 - Discussion of an amendment to the Comprehensive Zoning Ordinance, Article XXI, Landscaping Regulations, as to the replacement of existing trees and pruning guidelines, said amendment to be considered for adoption at the November 14, 2000, Regular Meeting of the Addison City Council.

Item #WS7 - Discussion of Town financial policies.

Item #WS8 - Discussion of the electronic agenda.

Item #WS9 - Discussion of E-Government.

Work Session & Agenda Item

TOWN OF ADDISON

PUBLIC WORKS DEPARTMENT (972) 450-2871

Post Office Box 9010 Addison, Texas 75001-9010 16801 Westgrove

MEMORANDUM

To: Chris Terry / Asst. City Manager

From: Michael E. Murphy, PE / Director of Public Works

Re: Engineering Design for Arapaho Road Extension from Addison Road to Surveyor Blvd.

Date: November 8, 2000

The over all design and construction of the extension of Arapaho from Dallas North Tollway to Marsh Lane is planned to be performed in 3 phases. Construction of Phase I of this project from the Tollway to Addison Road has recently been completed.

HNTB Engineering was contracted by the Town of Addison to lay out and design Phases II and III of the Arapaho Road Extension. The ***preliminary*** design for Phase II and III has been completed and ***final*** design for Phase II is currently underway.

Phase III, the extension of Arapaho Road from Addison Road to Surveyor Boulevard, includes a section that is designed to "fly over" Midway Road by way of a grade-separated overpass with no on/off ramps or signalized intersection. Because of the location and lack of access to Midway Road from the proposed overpass, Town of Addison staff was instructed to contract an outside engineering firm to perform an independent traffic engineering study of the impact and usage that would result by modifying the original design to include on/off ramps and a signalized intersection at Midway and Arapaho.

Town of Addison contracted the services of Lee Engineering to perform the referenced traffic engineering study with the following conclusions:

- Ramps increase diversion of Belt Line Road traffic to Arapaho Road by 4 – 6 percent.
- An at grade connection would significantly impact traffic operations on Midway/Belt Line and on Midway/Arapaho.

- Signalized connections with the grade separation would allow full utilization of the interchange, but would increase system wide delays and would significantly delay ramp traffic.

- With the grade separation, unsignalized connections would have the least impact on traffic along Midway, but would also not allow as much traffic to utilize the interchange as compared to the signalized alternatives.

- Increased adverse affects to adjacent properties as a result of construction of the on/off ramps.

HNTB was asked to prepare a plan view of the intersection, with ramps, to show the impact on adjacent properties, and to prepare an estimate of the increase in construction costs due to the ramps. As a result of on/off ramp construction it is estimated that project costs would increase by $5 million to $8 million due to ramp construction and additional property acquisition.

Therefore, after reviewing the traffic engineering study prepared by Lee Engineering and increased costs, including the impact to the affected properties, it is staff's recommendation to stay with the original HNTB plan of a bridge over Midway Road with ***no*** connection to Midway Road.

17440 DALLAS PARKWAY
SUITE 204
DALLAS, TEXAS 75287
972•248•3006 FAX 972•248•3855

LEE ENGINEERING

October 12, 2000

Mr. Jim C. Pierce, P.E.
Assistant City Engineer
Town of Addison
16801 Westgrove Drive
Addison, Texas 75001-9010

Re: Arapaho Road Alignment/Access Study Review

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Based on our review, a connection would increase the utilization of the Arapaho extension. The connection would also impact local properties and could negatively impact traffic operations along Midway Road in the area.

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POTENTIAL DIVERTED TRIPS

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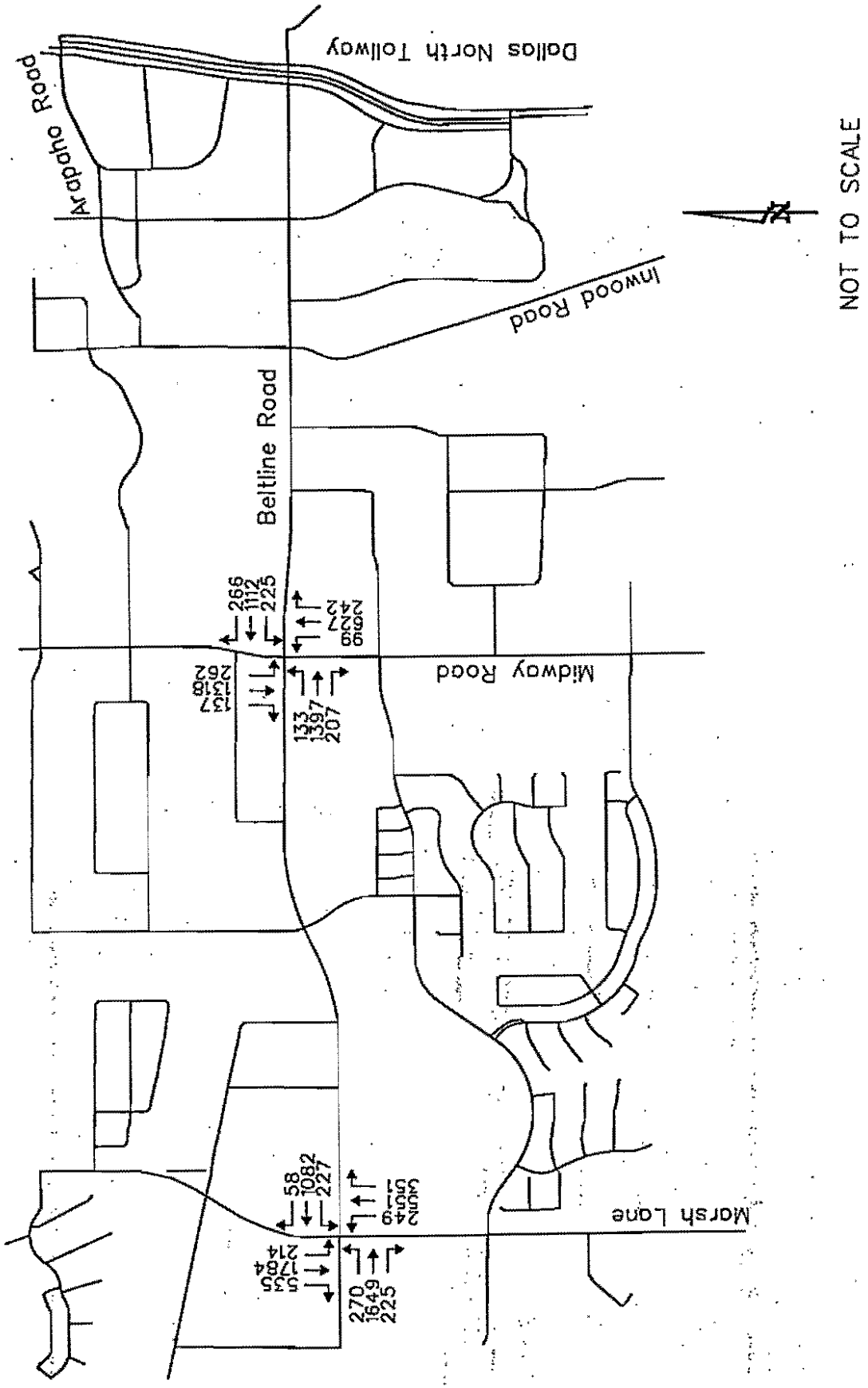


Figure 1A

Beltline at Midway and Marsh
Intersection Volumes (AM Peak Hour)

ENGINEERING

Figure 1B

Beltline at Midway and Marsh
Intersection Volumes (Noon Peak Hour)

ENGINEERING

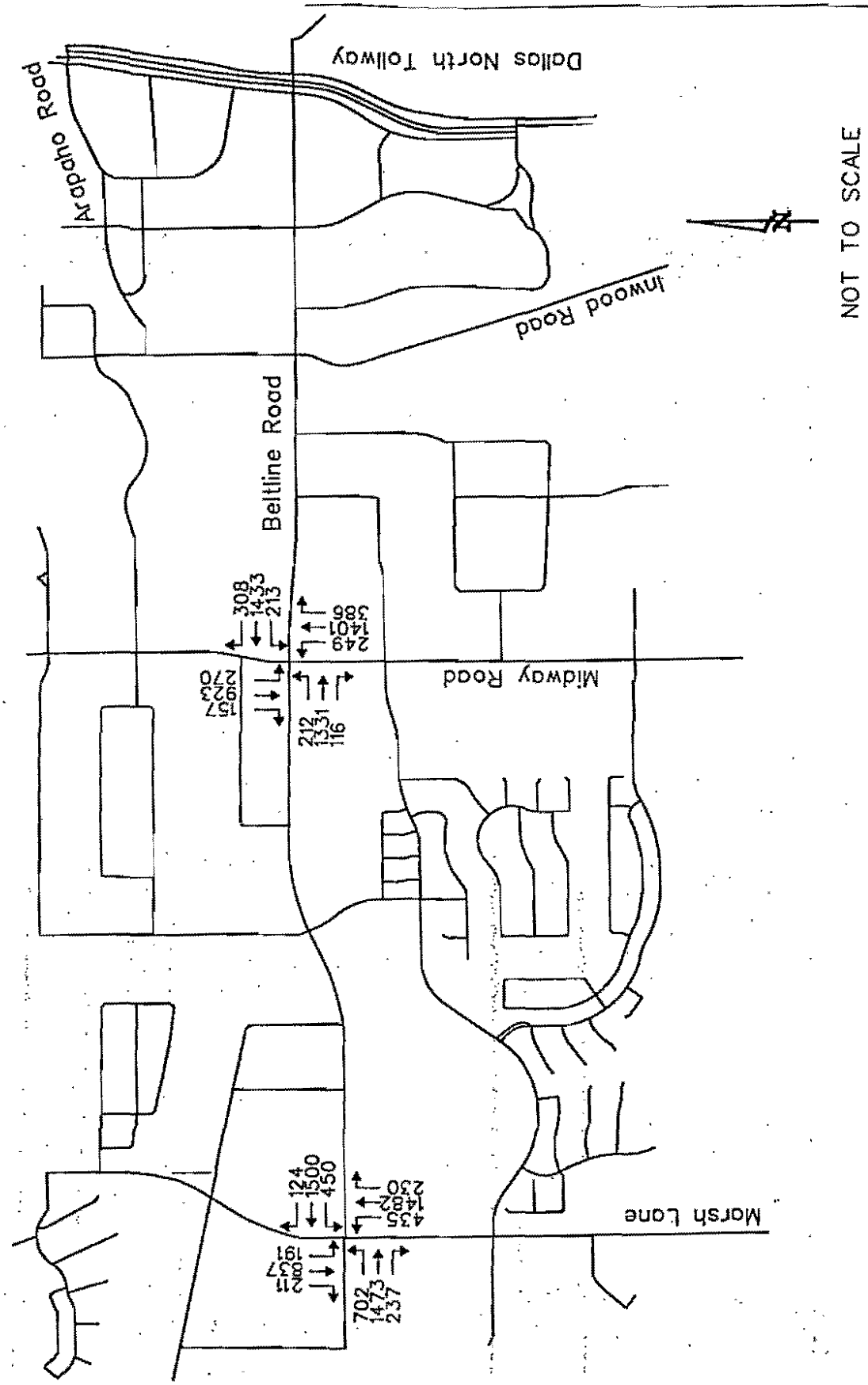
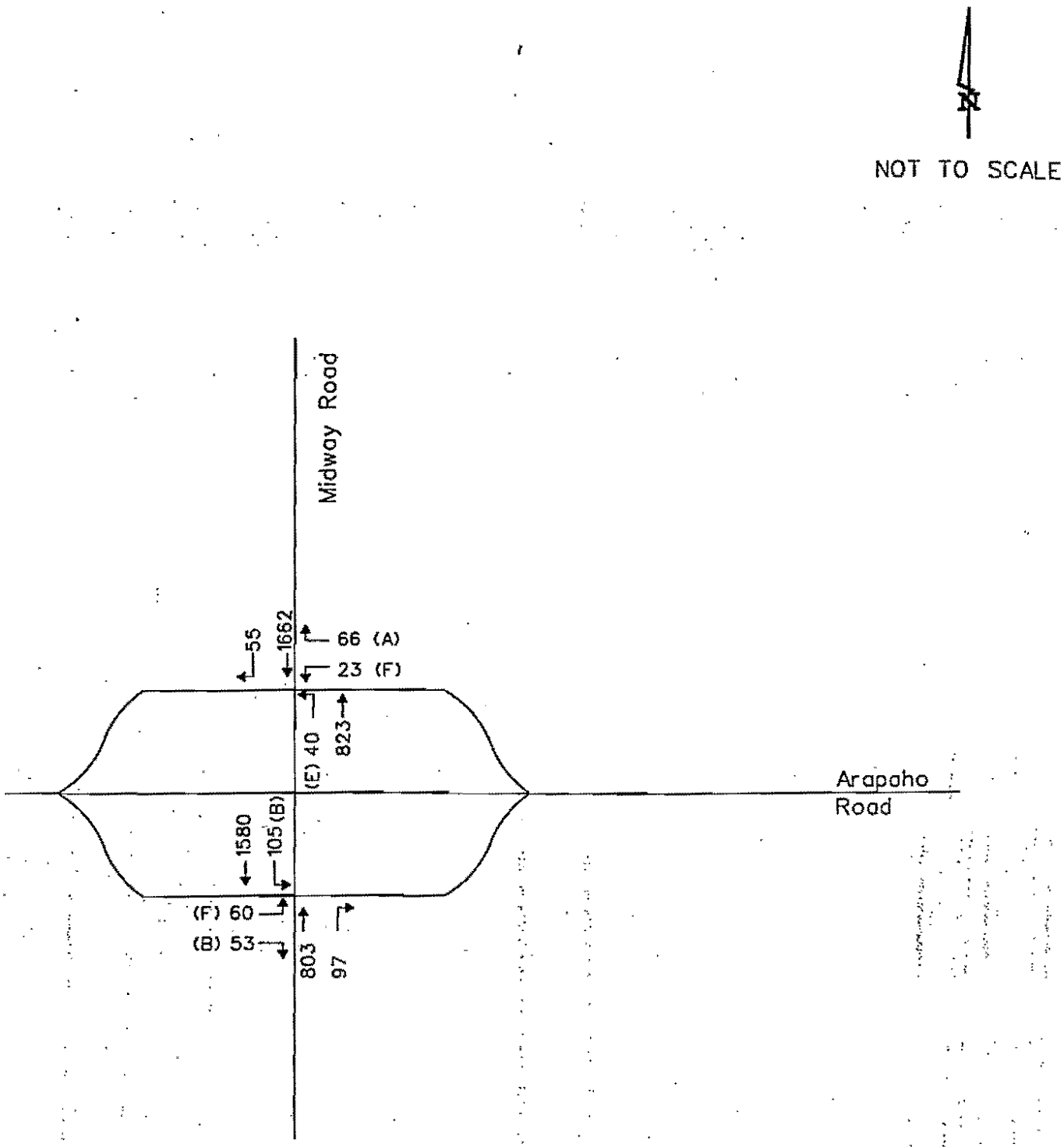


Figure 1C

Beltline at Midway and Marsh
Intersection Volumes (PM Peak Hour)

ENGINEERING



XX - Estimated Volumes
(A) - Level of Service

Figure 2A

Arapaho/Midway Intersection with Ramps (AM Peak Hour)

LSA ENGINEERING

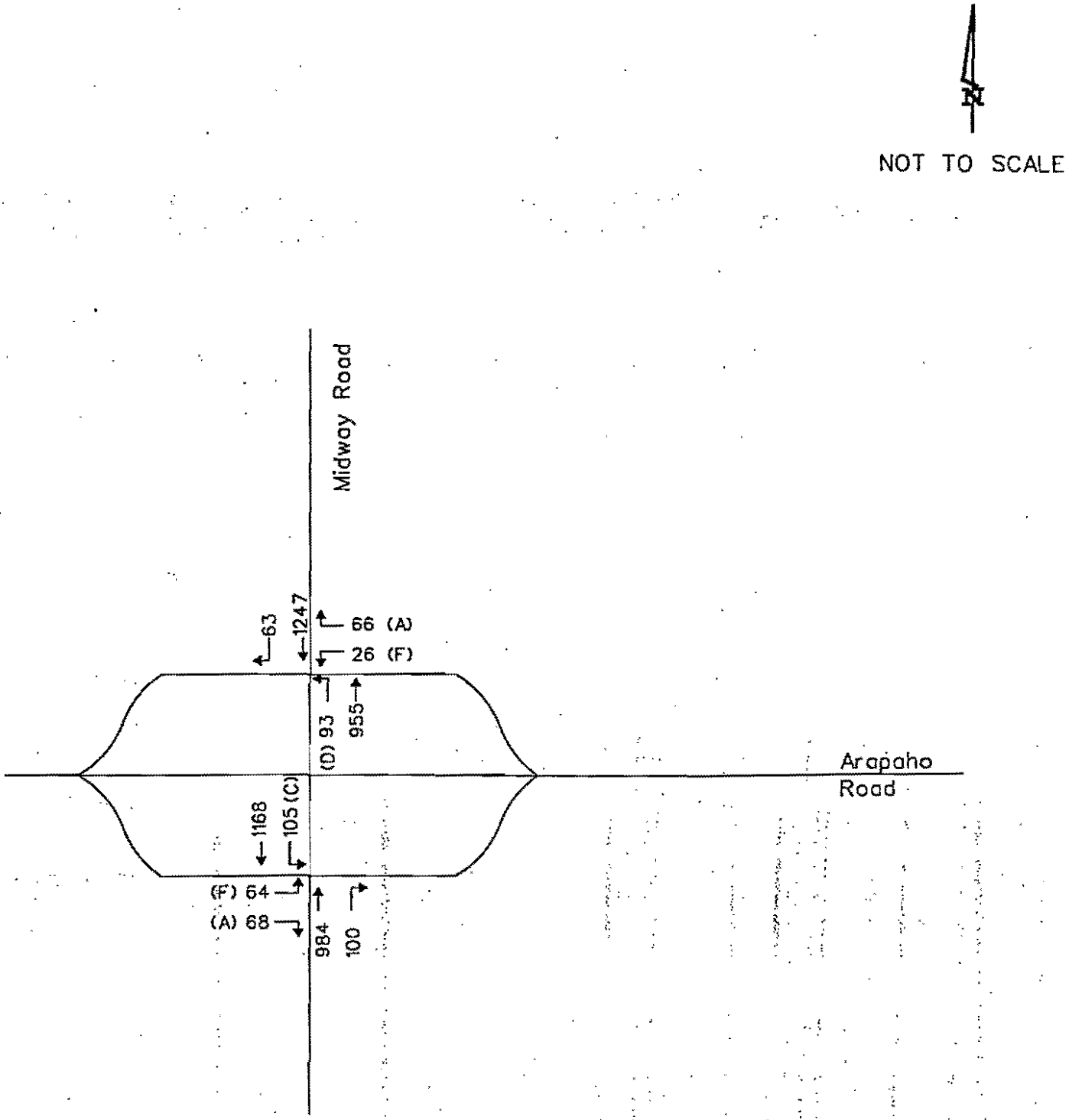


Figure 2B

Arapaho/Midway Intersection with Ramps (Noon Peak Hour)

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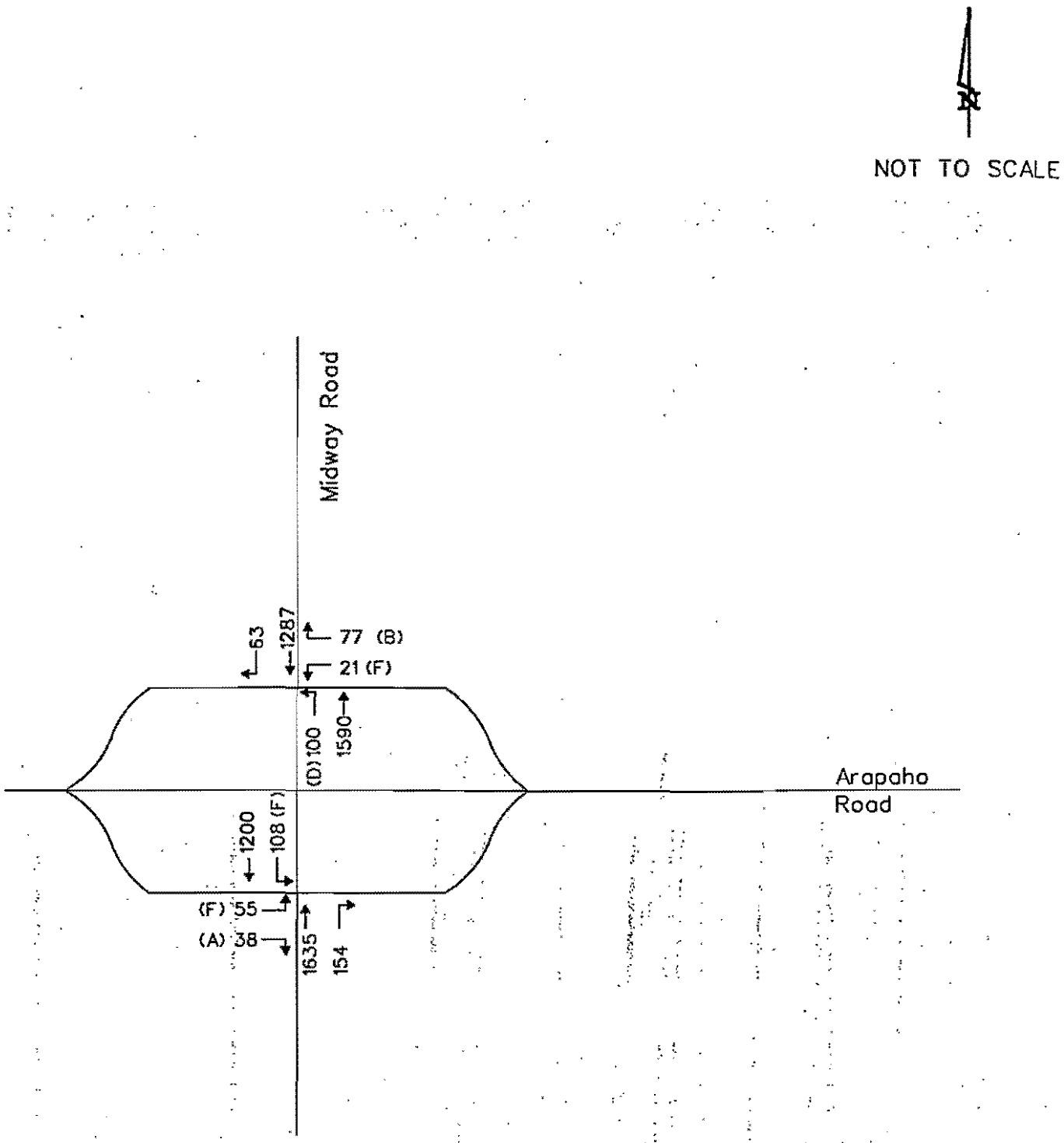

XX - Estimated Volumes
(A) - Level of Service

ENGINEERING

Figure 2C

Arapaho/Midway Intersection with Ramps (PM Peak Hour)

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At-grade intersection

The first alternative tested was an at-grade intersection connection between Arapaho Road and Midway Road. This intersection was assumed to be signalized and coordinated with the existing signal at Beltline Road at Midway Road. Analyses were conducted for existing conditions, conditions with the currently proposed grade separation, and for an at-grade intersection between Arapaho and Midway. The results of these analyses are summarized in Table 2.

Table 2. At-grade Intersection Operations

Intersection/Peak Hour	Existing Conditions	With Grade Separation	With At-grade Connection
Beltline at Midway	Level of Service (Total Vehicle Delay)		
AM	D (66 veh-hrs)	D (55 veh-hrs)	C (42 veh-hrs)
Noon	D (60 veh-hrs)	D (55 veh-hrs)	D (47 veh-hrs)
PM	E (120 veh-hrs)	D (70 veh-hrs)	D (67 veh-hrs)
Arapaho at Midway			
AM	N/A	N/A	C (32 veh-hrs)
Noon	N/A	N/A	C (30 veh-hrs)
PM	N/A	N/A	C (45 veh-hrs)

After reviewing these analyses it was determined that while the intersections would operate at acceptable levels of service, providing an at-grade intersection with a traffic signal at this location would have a significant impact on total system delay and travel times on Midway Road and on the Arapaho Road extension.

As can be seen, delays at the Beltline/Midway intersection will be reduced under either alternative. This is due to the reduction in through traffic on Beltline Road. As can also be seen, the total system delay would increase significantly with the addition of the signalized intersection of Arapaho at Midway. Total system delays obtained by adding the total delays at each intersection would increase from 55 vehicle-hours per hour to 74 vehicle-hours per hour in the AM peak, from 55 to 77 in the noon peak, and from 70 to 112 in the PM peak.

A review of delays to individual movements showed that during the time periods analyzed, the at-grade connection with a signal would have minimal impacts on travel times for southbound Midway; however, northbound Midway travel times would be increased by as much as 21 seconds per vehicle.

Further review revealed that travel times on eastbound Arapaho for vehicles traveling from Marsh Lane to Addison Road during the hours analyzed would increase from approximately 130 seconds to between 146 and 162 seconds. This represents an increase of between 19 and 24 percent. Westbound travel times would increase by between 22 and 38 seconds.

A summary of the measures of effectiveness calculated in this analysis is presented in a table attached to this letter. These measures of effectiveness include total stops, fuel consumption, and vehicle emissions. As can be seen, all of these measures for the grade separation alternative are significantly better than the at-grade intersection alternative.

Another complication that would effect a signalized intersection of Arapaho and Midway is the proximity of the rail road tracks. Any time a train crosses Midway, the signal at Arapaho would be preempted and coordination along Midway between Arapaho and Beltline would be interrupted.

Grade Separation with Signalized Ramp Connections

The grade separated alternative was first tested with the ramp intersections with Midway controlled by traffic signals. Projected traffic volumes at these intersections shown in figures 2A, 2B, and 2C were used in this analysis. Signal timing plans were developed for the two intersections to provide coordinated operations with the existing signal at Beltline at Midway. The results of these analyses are summarized in Table 3. Again these results were compared to existing conditions and conditions with a grade separation and no connections to Midway.

As can be seen, operations at each of the intersection will be at acceptable levels of service. The additional total system delay (the sum of the total delay at each intersection) introduced by the addition of the signalized ramp connections is 16, 13, and 24 vehicle hours in the AM, Noon and PM peak hours respectively. The signal control will significantly delay the ramp movements. To maintain some level of progression on Midway, the phase time for the ramp connections was limited to 20 seconds out of the 120 second cycle. This will adequately serve the ramp volumes, but will also require some ramp traffic to stop and wait up to 100 seconds for a green indication.

Table 3. Signalized Ramp Connection Operations

Intersection/Peak Hour	Existing Conditions	With Grade Separation	With Signalized Ramp Connections
Beltline at Midway	Level of Service (Total Vehicle Delay)		
AM	D (66 veh-hrs)	D (55 veh-hrs)	C (43 veh-hrs)
Noon	D (60 veh-hrs)	D (55 veh-hrs)	C (46 veh-hrs)
PM	E (120 veh-hrs)	D (70 veh-hrs)	D (66 veh-hrs)
Eastbound Arapaho at Midway			
AM	N/A	N/A	B (11 veh-hrs)
Noon	N/A	N/A	B (9 veh-hrs)
PM	N/A	N/A	B (10 veh-hrs)
Westbound Arapaho at Midway			
AM	N/A	N/A	C (17 veh-hrs)
Noon	N/A	N/A	C (13 veh-hrs)
PM	N/A	N/A	C (18 veh-hrs)

Queue lengths were also reviewed under the signalized ramp connection scenario. This review revealed that the southbound queue in the AM peak hour was found to be the most critical. Southbound queues in the AM peak hour average over 450 feet in length with peak queue lengths of over 500 feet. The eastbound ramps will intersect Midway approximately 650 feet north of Beltline Road. While the queue does not exceed the storage available, this level of queuing from the Beltline intersection may interfere with operations at the ramp connections. Continuing traffic volume growth in the future may also result in longer queues.

A summary of the measures of effectiveness calculated in this analysis is also presented in a table attached to this letter. Again, these measures of effectiveness include total stops, fuel consumption, and vehicle emissions. These measures for the grade separation alternative without connections are better than the signalized connection alternative.

Another complication that would effect the signalized connections between Arapaho and Midway is the proximity of the rail road tracks. Any time a train crosses Midway, the signals at the Arapaho connections would be preempted and coordination would be interrupted.

Grade Separation with Unsignalized Ramp Connections

The other grade separation alternative tested utilized unsignalized ramp connections to Midway. Capacity analyses were conducted for each intersection using the Highway Capacity Software. The results of these analyses are presented in Figures 2A, 2B, and 2C and are summarized in Table 4.

Table 4. Capacity Analysis Results

Intersection	Movement	Level of Service		
		AM Peak	Noon Peak	PM peak
Midway at Westbound Ramps	Westbound Right	A	A	B
	Westbound Left	F	F	F
	Northbound Left	E	D	D
Midway at Eastbound Ramps	Eastbound Right	B	A	A
	Eastbound Left	F	F	F
	Southbound Left	B	C	F

As can be seen, several movements would operate at unacceptable levels of service (E or F). In an effort to ensure efficient traffic operations on Midway, those movements that are projected to operate at unacceptable levels of service were assumed to be prohibited. Intersection volumes were then adjusted to reflect the prohibition of these movements. The intersections were analyzed with the adjusted volumes to ensure that all movements would operate at acceptable levels of service. These analyses confirmed that the movements that would be allowed would operate at levels of service D of better.

TOTAL DIVERSIONS

After determining which movements could and could not be accommodated at an interchange of Arapaho Road and Midway Road, total daily diverted traffic volumes were estimated. This was accomplished by averaging the peak hour diverted volumes and assuming that this average peak hour represented an industry average of 10 percent of the daily volume on the roadway.

With the signalized alternatives, either at-grade or with the grade separation, all movements were assumed to be allowed, and the total potential additional traffic on the Arapaho Road extension west of Midway Road would be 2,500 vehicles per day and 3,160 vehicles per day east of Midway Road. These numbers represent increases of 19 and 24 percent over the projected traffic volumes on Arapaho Road without an interchange.

With an unsignalized connection several movements would be prohibited and the results of these calculations showed total potential additional traffic on the Arapaho Road extension west of Midway Road would be 1,130 vehicles per day and 1,870 vehicles per day east of Midway Road. These numbers represent increases of nine and 14 percent over the projected traffic volumes on Arapaho Road without an interchange.

IMPACT OF CONNECTIONS

The ramps required to complete the connections between the Arapaho Extension and Midway Road will have a significant impact on adjacent properties. Based on our preliminary review, these ramps would require the taking of the Charter Furniture building in the southwest quadrant of the intersection. The ramps would also take more parking area from the property on the southeast corner and eliminate the potential for providing parking for the property under the overpass structure. Preliminary schematic plans for these ramps have been prepared by HNTB.

Due to the impact of these ramps, alternative connections were explored. One potential connection would utilize an open piece of property west of Midway to provide a connection between Centurion and the Arapaho extension. Upon further examination, it was discovered that this connection would only provide for eastbound and westbound to southbound and southbound to eastbound and westbound connections efficiently. This alternate connection would result in only 1,130 diverted vehicles per day west of Midway and 1,290 vehicles per day east of Midway. It was also discovered that Arapaho Road would still be on a retaining wall structure at this location, thus making this connection more difficult to provide.

CONCLUSIONS AND RECOMMENDATIONS

A connection could be made between the Arapaho Road extension and Midway Road and would result in an increased utilization of Arapaho Road of between 15 and 25 percent. This represents a diversion off of Beltline Road of between 4 and 6 percent.

The following general observations are also made:

- An at-grade connection would significantly impact traffic operations on Midway and on Arapaho.
- Signalized connections with the grade separation would allow full utilization of the interchange, but would increase system wide delays and would significantly delay ramp traffic.
- With the grade separation, unsignalized connections would have the least impact on traffic along Midway, but would also not allow as much traffic to utilize the interchange as compared to the signalized alternatives.

If you have any questions, please contact me at (972) 248-3006. We appreciate the opportunity to provide these services.

Sincerely,

J. T. Short

Joseph T. Short, P.E.
Office Manager

cc Mike
Bill

MEMO

October 16, 2000

To: Jim Pierce, Assistant Director of Public Works

From: Steve Chutchian, Assistant City Engineer

Re: Arapaho Road
Property Appraisals

A "Sales Comparison" Approach was utilized for determining fair market value of two "full" property acquisitions that are located adjacent to the proposed Arapaho Road extension improvements. Data was obtained from an equivalent appraisal of an office/flex/warehouse property on Surveyor Blvd., performed in April, 2000. A land to building ratio for this property was 2.73. The following is a generation of land to building ratio for the Charter Furniture and MBNA tracts, respectively:

	Charter Furniture	MBNA
Scaled Land Size (s.f.)	149,000	110,260
Scaled Building Size (s.f.)	54,380	40,837
Land to Building Ratio	2.74	2.70

The adjusted acquisition price for the Surveyor Blvd. Site was $60.00 per square foot. The Charter Furniture and MBNA tracts have ratios that are very similar to the Surveyor Blvd. site. Therefore, a unit price of $60.00 per square foot was used to determine each estimated market value:

Charter Furniture:

54,380 s.f. @ $60.00/s.f. = $3,262,800

MBNA:

40,837 s.f. @ $60.00/s.f. = $2,450,220

Steve Chutchian

Steve Chutchian
Assistant City Engineer

N

Not to Scale

cc Mike
Bill

MEMO

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Steve Chutchian

Steve Chutchian
Assistant City Engineer

HNTB ARCHITECTS ENGINEERS PLANNERS

14114 Dallas
Parkway, Suite 630
Dallas, Texas
75240-1381
(972) 661-5626
FAX (972) 661-5614

October 9, 2000

cc Mike
Bill

Town of Addison
16801 Westgrove Drive
P.O. Box 9010
Addison, TX 75001-9010

Attn: Mr. James C. Pierce, Jr., P.E., DEE

ARAPAHO ROAD EXTENSION
Cost Estimate for Arapaho Ramps at Midway

Dear Mr. Pierce:

Per our meeting on Wednesday, October 4, 2000, you asked HNTB to prepare a cost estimate for the Arapaho ramps at Midway. Attached is a sketch of the ramps and a cost estimate spreadsheet. The estimated construction cost for the ramps is $1,369,744.

Should you have any questions or need any further information, please call our office.

Very truly yours,

HNTB CORPORATION

Daniel F. Becker

Enclosures

DBF/AMS/tlf

Arapaho Road Extension
Midway Ramps Cost Estimate
6-Oct-00

Item No.	Item Description	Unit	Quantity	Unit Price	Amount
110	Excavation	CY	1,709	$5.00	$8,545
132	Embankment	CY	9,504	$7.00	$66,528
260	Lime Treated Subgrade (6")	SY	7,554	$2.00	$15,108
260	Lime	Ton	113	$86.00	$9,744
360	Flex Rein Concrete Pvmt (10")	SY	7,554	$40.00	$302,160
423	Retaining Wall	SF	11,500	$40.00	$460,000
450	Rail (Ty 501)	LF	2,400	$20.00	$48,000
666	Striping	LF	7,600	$1.00	$7,600
	Traffic Signal	LS	1	$120,000.00	$120,000
				Subtotal	$1,037,685
				Contingencies (20% of total)	$207,537
				Subtotal	$1,245,222
				Mobilization (10% of total)	$124,522
				Total	$1,369,744

Addison!

JIM PIERCE, P.E.
Assistant Public Works Director
(972) 450-2879
(972) 450-2837 FAX
jpierce@ci.addison.tx.us

Town of Addison 16801 Westgrove Dr. P.O. Box 9010, Addison, Texas 75001-9010

10-17-02

Bill: We now have

- Jodys Report (attached)
- Alignment drawings from HNTB showing Ramps.
- Increased Cost of Const for ramps
- Est of Cost to acquire charter Furniture & MBNA Bldg. (attached)

Will you set up another Meeting with Bob Barrett? Jim

Addison!

JIM PIERCE, P.E.
Assistant Public Works Director
(972) 450-2879
(972) 450-2837 FAX
jpierce@ci.addison.tx.us

Town of Addison 16801 Westgrove Dr. P.O. Box 9010, Addison, Texas 75001-9010

10-10-00

Joe Dirigman —

Ron Whitehead asked that I send a copy of this to you. Please understand this is a Draft and is not complete. We are also looking at adding on and off ramps at Midway Road.

Jim

HNTB
The HNTB Companies

Fax Transmittal

To	James C. Pierce Jr. P.E.	Date	October 9, 2000
Firm	Town of Addison	Total Pages	3 (Including this cover)
Fax #	972 450 ~~2879~~ 2837	Job Number	25768
From	Dan Becker/Angie Stoddard	☒ High Resolution ☒ Urgent	

Please notify sender at 972-661-5626 if pages are missing or if there is any transmission difficulty.

Message

Attached is an estimated cost for the addition of the diamond interchange ramps at Midway Road to the Arapaho Rd. Extension Project.

14114 Dallas Parkway, Suite 630 • Dallas, Texas 75240
Voice (972) 661-5626 • Fax (972) 661-5614

October 9, 2000

File 25768

Town of Addison
16801 Westgrove Drive
P.O. Box 9010
Addison, TX 75001-9010

Attn: Mr. James C. Pierce, Jr., P.E., DEE

ARAPAHO ROAD EXTENSION
Cost Estimate for Arapaho Ramps at Midway

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Should you have any questions or need any further information, please call our office.

Very truly yours,

HNTB CORPORATION

Daniel F. Becker

Enclosures

DBF/AMS/tlf

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6-Oct-00

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				Contingencies (20% of total)	$207,537
				Subtotal	$1,245,222
				Mobilization (10% of total)	$124,522
				Total	$1,369,744

Jeff Copy cc Bill Shipp
Mike Murphy
Chris Terry

DRAFT

September 20, 2000

Mr. Jim C. Pierce, P.E.
Assistant City Engineer
Town of Addison
16801 Westgrove Drive
Addison, Texas 75001-9010

Re: Arapaho Road Alignment/Access Study Review

Dear Mr. Pierce:

Per your request, Lee Engineering has performed a review of the Alignment Study Report for Proposed Arapaho Road Extension prepared by HNTB. The recommended configuration of Arapaho Road from the HNTB report includes an overpass over Midway Road with no connection provided for traffic to interchange between Arapaho Road and Midway Road. The primary purpose of this review was to identify connection alternatives and determine if a connection between Arapaho Road and Midway Road would be practical and would allow the Arapaho extension to be more fully utilized.

Based on our review, a connection would increase the utilization of the Arapaho extension. However, the increased utilization would not be enough to warrant the additional cost and right of way impacts of making the connection.

STUDY APPROACH

In reviewing the Alignment Study and the recommended configuration for Arapaho Road the following key steps were taken:

1. Reviewed study reports,
2. Reviewed background data,
3. Collected additional data as needed,
4. Identified and assigned potential diverted trips,
5. Analyzed operations with connections,
6. Eliminated connection alternatives that would negatively impact traffic operations,
7. Estimated total diversions of acceptable movements, and
8. Evaluated alternative connection configurations,

This approach was somewhat iterative as total diversions were first estimated and then individual

movements were eliminated as connection alternatives were determined to be impractical.

PREVIOUS REPORTS

As a part of the previous study conducted for this interchange, traffic projections for the Arapaho Road extension were made based on travel demand model runs completed by the North Central Texas Council of Governments (NCTCOG). These projections indicate that without any connection between Arapaho Road and Midway Road the Arapaho extension is expected to carry 13,000 vehicles per day. With the various connection alternatives considered the NCTCOG projection ranged from 6,000 to 28,000 vehicles per day. It was assumed in conducting the analysis that the projected volume of traffic on the Arapaho extension developed by NCTCOG with no connection to Midway Road is reliable.

Upon further review of the underlying data provided by NCTCOG, we determined that a better estimate of future traffic volumes on the Arapaho Road extension with some form of connection in place could be made by reviewing existing count data at area intersections. This review would focus on turning movement volumes that would potentially use the connections provided.

DATA COLLECTION

In an effort to better estimate the number of trips that would be diverted to the Arapaho extension a data collection plan was devised. The area roadway network and area intersections were reviewed to determine the paths from which traffic could be expected to utilize a connection at Midway to divert to the new Arapaho extension. Peak period turning movement counts were collected at the intersections of Beltline at Midway and Beltline at Marsh. These counts and the area roadway network are presented in Figures 1A, 1B, and 1C. This sampling of area intersections served as a basis for estimating diverted traffic volumes.

POTENTIAL DIVERTED TRIPS

Estimates were made of the percentages of existing turning movements from adjacent intersections that could be diverted to the new Arapaho Road extension if all possible movements were accommodated in the connection. These percentages, summarized in Table 1, were reviewed with Town staff for concurrence.

The percentages were then applied to the existing volumes to generate estimates of trips that could potentially be diverted if a connection were provided at Arapaho Road and Midway Road. These estimates and the resulting total intersection volumes for the potential interchange of Arapaho Road and Midway Road are shown on the schematic drawing of the interchange in Figures 2A, 2B, and 2C.

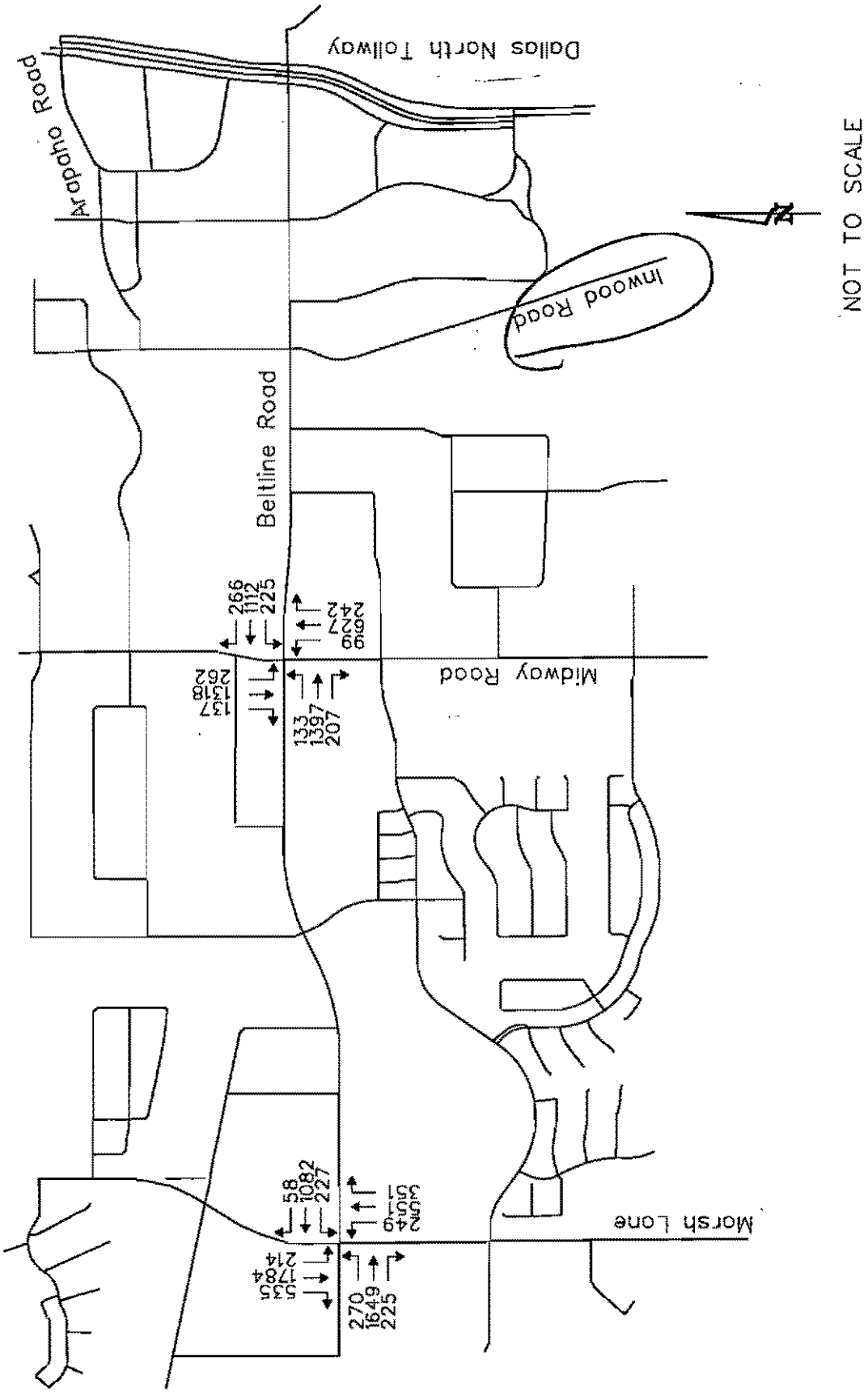

Figure 1A

Beltline at Midway and Marsh
Intersection Volumes (AM Peak Hour)

Figure 1B

Beltline at Midway and Marsh
Intersection Volumes (Noon Peak Hour)

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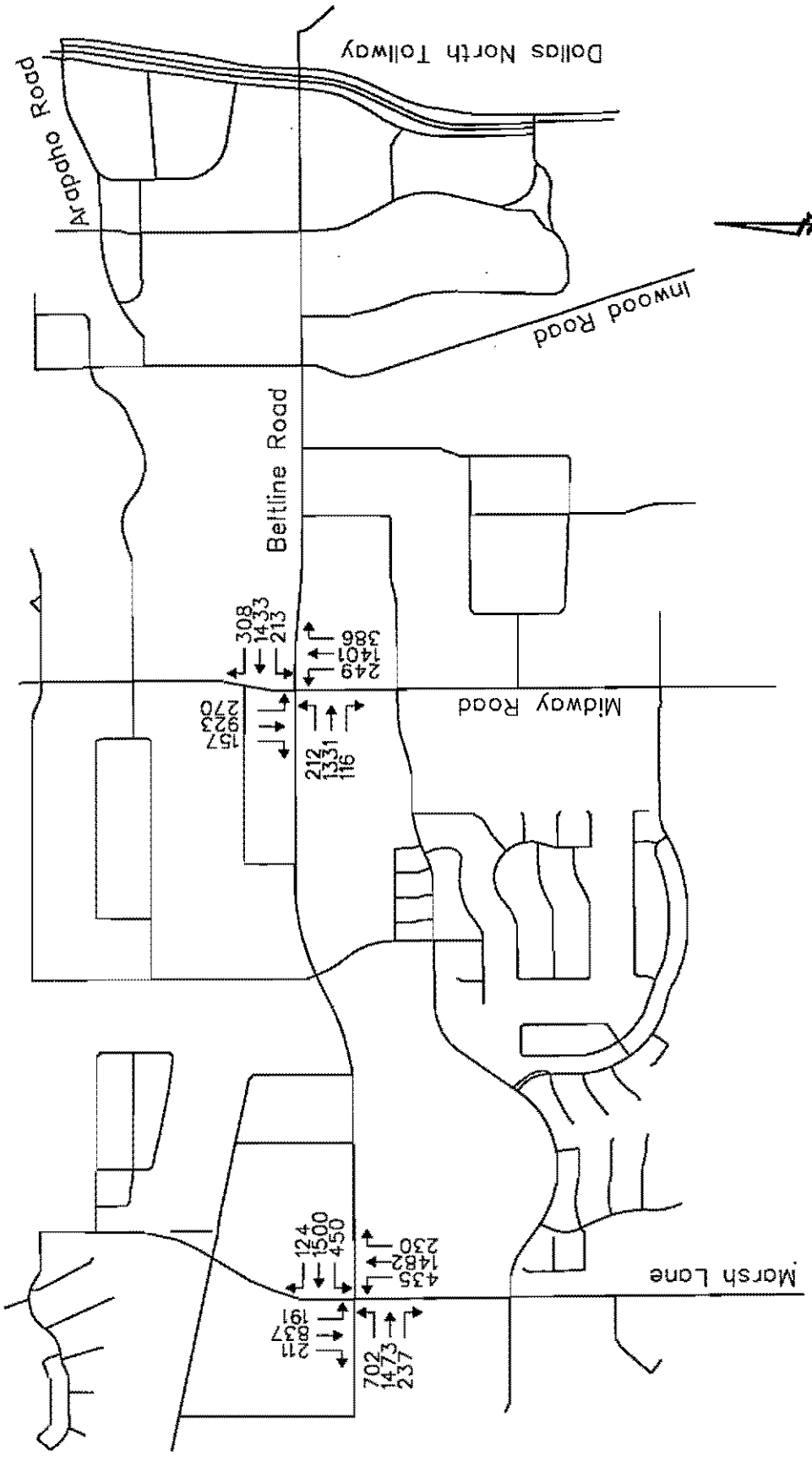

Figure 1C

Beltline at Midway and Marsh
Intersection Volumes (PM Peak Hour)

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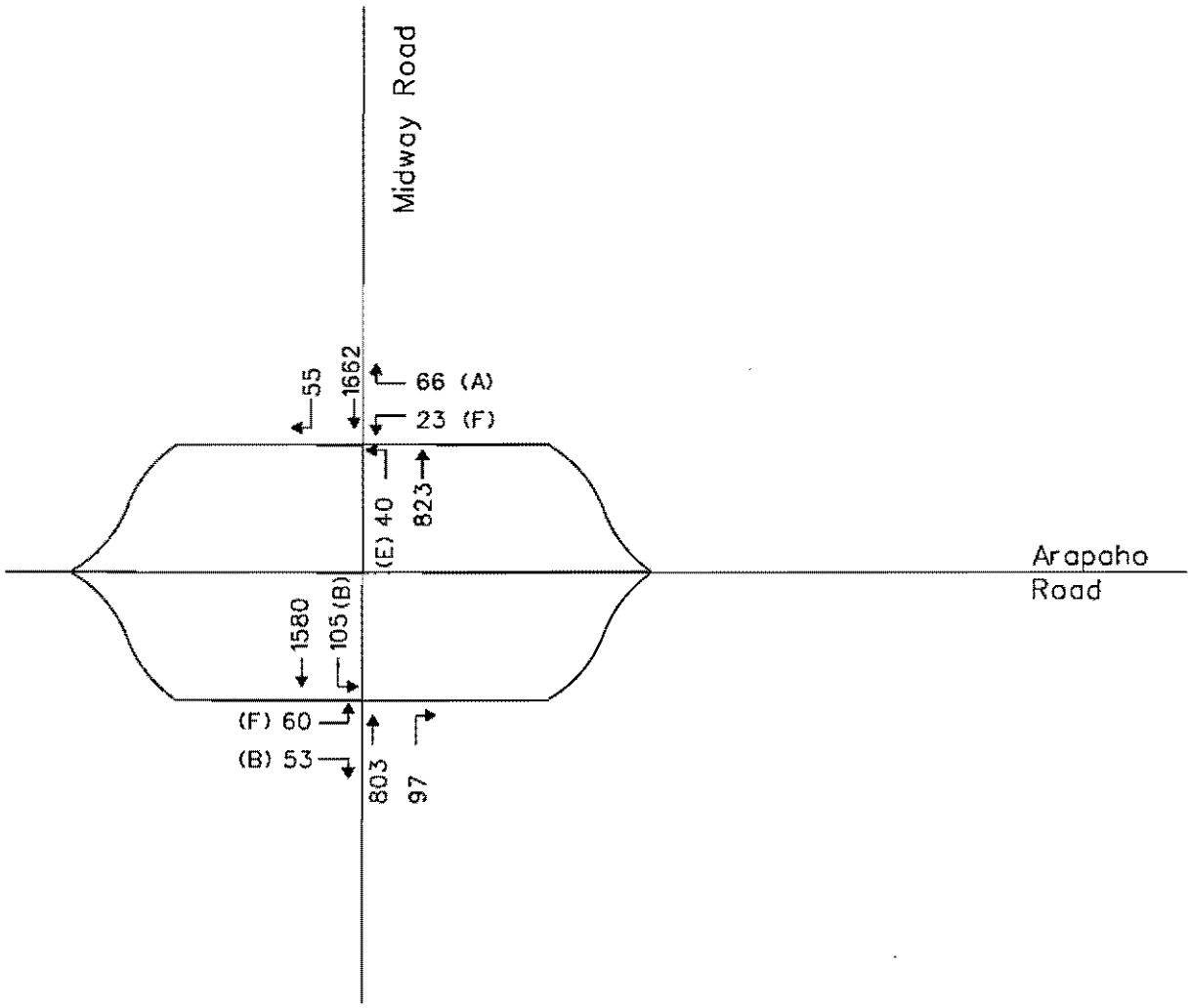

Figure 2A

Arapaho/Midway Intersection with Ramps (AM Peak Hour)

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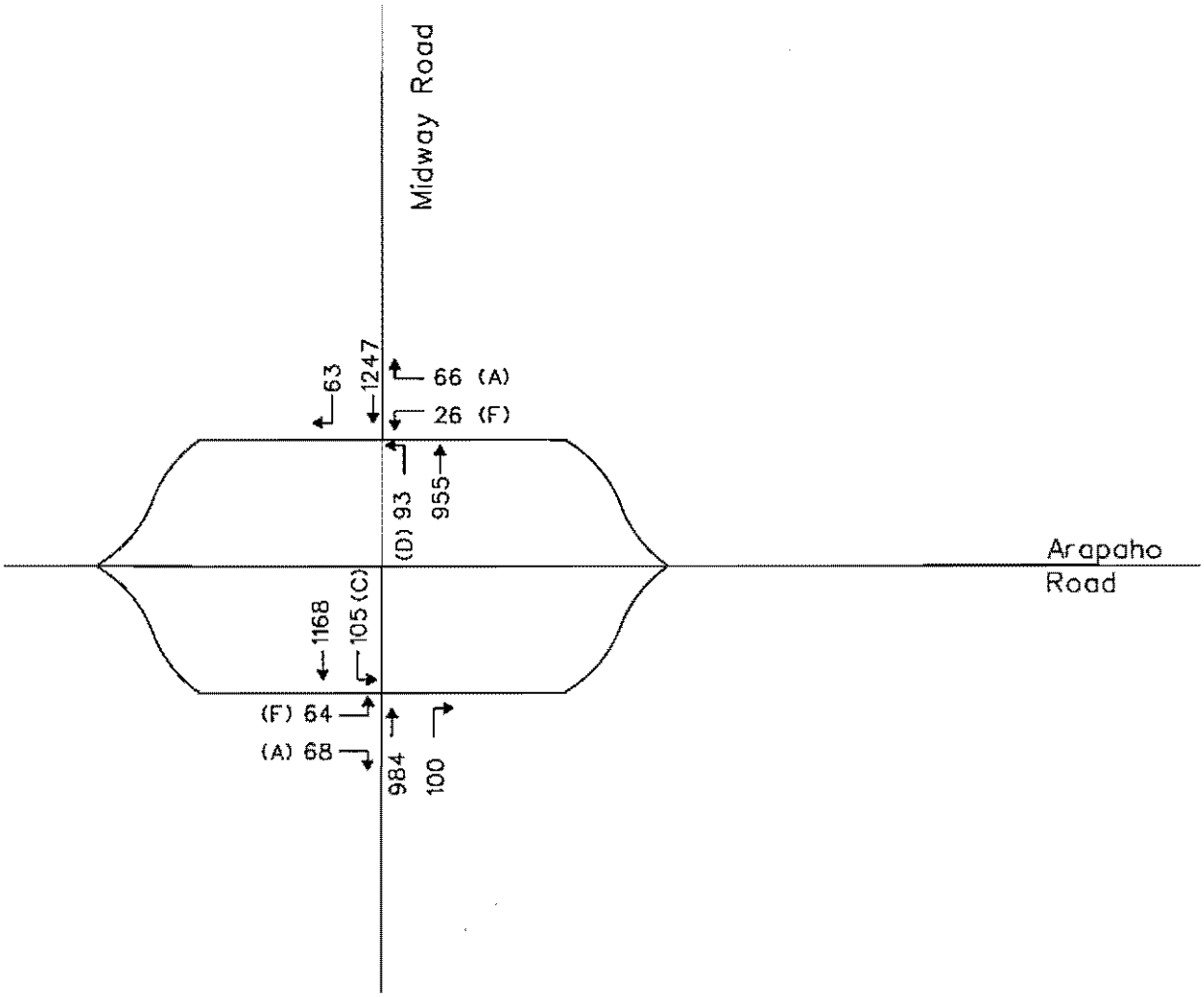

Figure 2B

Arapaho/Midway Intersection with Ramps (Noon Peak Hour)

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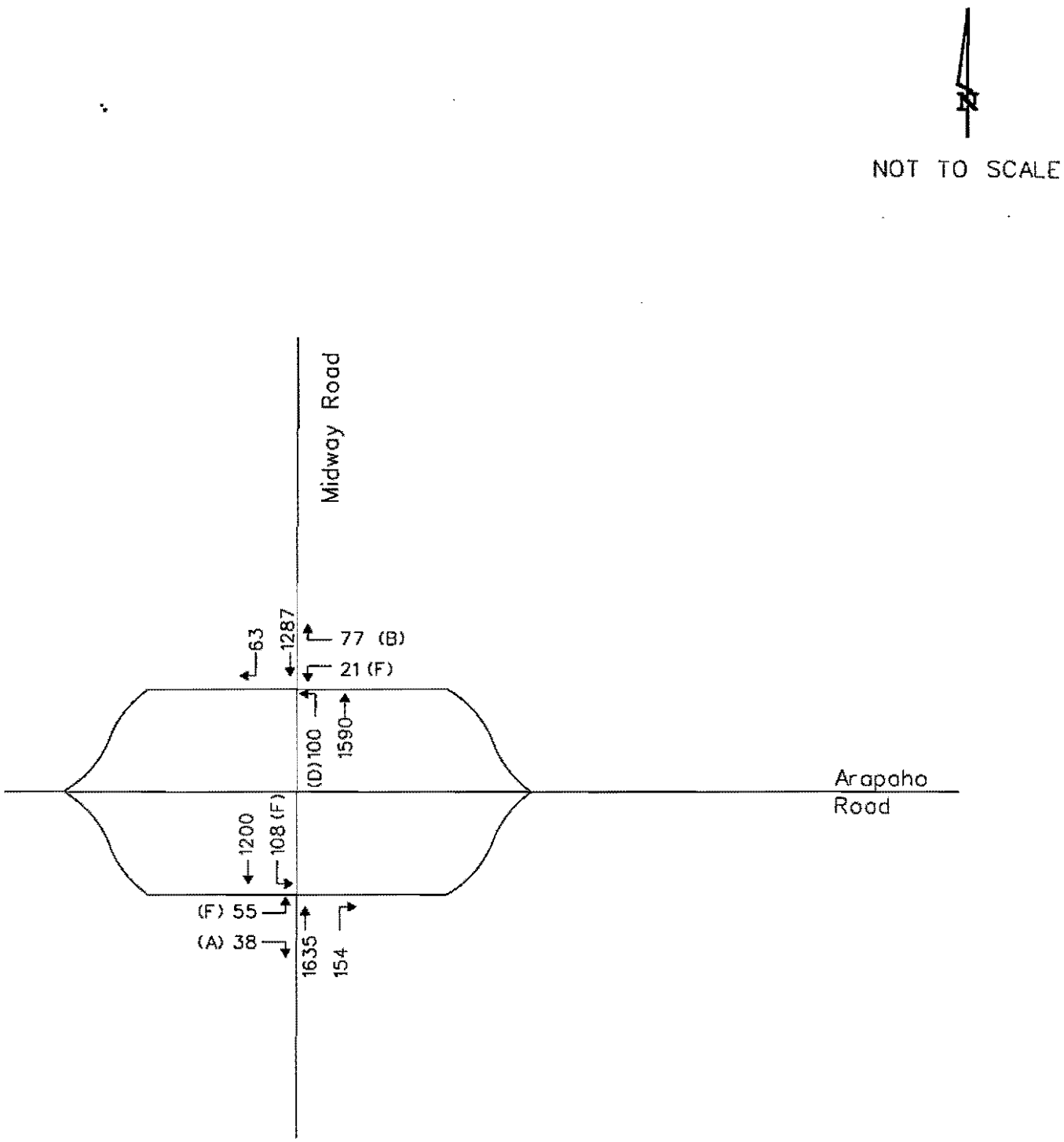

XX - Estimated Volumes
(A) - Level of Service

Figure 2C

Arapaho/Midway Intersection with Ramps (PM Peak Hour)

...\addison\arapaho&midway.dgn Sep. 20, 2000 15:31:29

Table 1. Turning Movement Diversions

Existing Movement	Movement Diverted To	Percentage Diverted
Southbound Right turn at Midway/Beltline	Southbound Right turn at Midway/Arapaho	40
Southbound Left turn at Midway/Beltline	Southbound Left turn at Midway/Arapaho	40
Eastbound Left turn at Midway/Beltline and Northbound Right turn at Marsh/Beltline	Eastbound Left turn at Midway/Arapaho	25
Northbound Left turn at Midway/Beltline	Northbound Left turn at Midway/Arapaho	40
Northbound Right turn at Midway/Beltline	Northbound Right turn at Midway/Arapaho	40
Westbound Left turn at Midway/Beltline	Westbound Left turn at Midway/Arapaho	10
Eastbound Right turn at Midway/Beltline and Southbound Left turn at Marsh/Beltline	Eastbound Right turn at Midway/Arapaho	25
Westbound Right turn at Midway/Beltline	Westbound Right turn at Midway/Arapaho	25

INTERSECTION OPERATIONS

Two primary alternative configurations were tested. One with an at grade intersection between Arapaho Road and Midway Road and the other with a grade separation and ramps extending from Arapaho Road to intersection with Midway Road.

At-grade intersection

The first alternative tested was an at grade intersection connection between Arapaho Road and Midway Road. This intersection was assumed to be signalized and coordinated with the existing signal at Beltline Road at Midway Road. Analyses were conducted for existing conditions, conditions with the currently proposed grade separation, and for an at grade intersection between Arapaho and Midway. The results of these analyses are summarized in Table 2.

Table 2. At-grade Intersection Operations

Intersection/Peak Hour	Existing Conditions	With Grade Separation	With At-grade Connection
Beltline at Midway	Level of Service (Total Vehicle Delay)		
AM	D (66 veh-hrs)	D (55 veh-hrs)	C (42 veh-hrs)
Noon	D (60 veh-hrs)	D (55 veh-hrs)	D (47 veh-hrs)
PM	E (120 veh-hrs)	D (70 veh-hrs)	D (67 veh-hrs)
Arapaho at Midway			
AM	N/A	N/A	C (32 veh-hrs)
Noon	N/A	N/A	C (30 veh-hrs)
PM	N/A	N/A	C (45 veh-hrs)

After reviewing these analyses it was determined that providing an at grade intersection with a traffic signal at this location would have a significant impact on traffic operations on Midway Road and on the Arapaho Road extension.

As can be seen, delays at the Beltline/Midway intersection will be reduced under either alternative. This is due to the reduction in through traffic on Beltline Road. As can also be seen, the total system delay would increase significantly with the addition of the signalized intersection of Arapaho at Midway. Total system delays would increase from 55 vehicle-hours per hour to 74 vehicle-hours per hour in the AM peak, from 55 to 77 in the noon peak, and from 70 to 112 in the PM peak

A review of delays to individual movements showed that during the time periods analyzed, the at-grade connection with a signal would have minimal impacts on travel times for southbound Midway, however northbound Midway travel times would be increased by as much as 21 seconds per vehicle.

Further review revealed that travel times on eastbound Arapaho for vehicles traveling from Marsh Lane to Addison Road during the hours analyzed would increase from approximately 130 seconds to between 146 and 162 seconds. This represents an increase of between 19 and 24 percent. Westbound travel times would increase by between 22 and 38 seconds.

A summary of the measures of effectiveness calculated in this analysis are presented in a table attached to this letter. These measures of effectiveness include total stops, fuel consumption, and vehicle emissions. As can be seen, all of these measures for the grade separation alternative are significantly better than the at-grade intersection alternative.

Another complication that would effect a signalized intersection of Arapaho and Midway is the proximity of the rail road tracks. Any time a train crosses Midway, the signal at Arapaho would be preempted and coordination between Arapaho would be interrupted.

Grade Separation with Ramp Connections

The next alternative tested was a grade separation with ramps connection to Midway. Under existing conditions, the southbound queue during the AM peak averages over 400 feet in length with peak queue lengths of over 500 feet. Based on these results, it was assumed that the intersections on Midway Road with the ramps from Arapaho Road would operate as unsignalized intersections. This is because the southern intersection with the eastbound ramps would be within 500 feet of the Beltline intersection.

Capacity analyses were conducted for each intersection using the Highway Capacity Software. The results of these analyses are presented in Figures 2A, 2B, and 2C and are summarized in Table 3.

Table 3. Capacity Analysis Results

Intersection	Movement	Level of Service		
		AM Peak	Noon Peak	PM peak
Midway at Westbound Ramps	Westbound Right	A	A	B
	Westbound Left	F	F	F
	Northbound Left	E	D	D
Midway at Eastbound Ramps	Eastbound Right	B	A	A
	Eastbound Left	F	F	F
	Southbound Left	B	C	F

As can be seen, several movements would operate at unacceptable levels of service(E or F). Because signalization is not an acceptable option, those movements that are projected to operate at unacceptable levels of service were assumed to be prohibited. Intersection volumes were then adjusted to reflect the prohibition of these movements. The intersections were analyzed with the adjusted volumes to ensure that all movements would operate at acceptable levels of service. These analyses confirmed that the movements that would be allowed would operate at levels of service D of better.

TOTAL DIVERSIONS

After determining which movements could and could not be accommodated at an unsignalized interchange of Arapaho Road and Midway Road, total daily diverted traffic volumes were estimated. This was accomplished by averaging the peak hour diverted volumes and assuming that this average peak hour represented an industry average of 10 percent of the daily volume on the roadway. The results of these calculations showed total potential additional traffic on the Arapaho Road extension west of Midway Road would be 1,130 vehicles per day and 1,870 vehicles per day east of Midway Road. These numbers represent increases of nine and 14 percent over the projected traffic volumes on Arapaho Road without an interchange.

IMPACT OF CONNECTIONS

The ramps required to complete the connections between the Arapaho Extension and Midway Road will have a significant impact on adjacent properties. Based on our preliminary review, these ramps would require the taking of the Charter Furniture building in the southwest quadrant of the intersection. The ramps would also take more parking area from the property on the southeast corner and eliminate the potential for providing parking for the property under the overpass structure.

Due to the impact of these ramps, alternative connections were explored. One potential connection would utilize an open piece of property west of Midway to provide a connection between Centurion and the Arapaho extension. Upon further examination, it was discovered that this connection would only provide for eastbound and westbound to southbound and southbound to eastbound and westbound connections efficiently. This alternate connection would result in only 1,130 diverted vehicles per day west of Midway and 1,290 vehicles per day east of Midway. It was also discovered that Arapaho Road would still be on a retaining wall structure at this location. Thus, the cost of providing this connection with the retaining wall structure would be significant.

CONCLUSIONS AND RECOMMENDATIONS

While a connection could be made between the Arapaho Road extension and Midway Road, the resulting benefit of increasing the utilization of Arapaho Road would be less than 15 percent. This represents a diversion off of Beltline Road of less that 4 percent. The cost of making these connections was not estimated. However, it is apparent that the taking of additional property and the additional construction cost would be significant. For these reasons we do not believe that benefits justify the cost of providing a connection between the Arapaho Road extension and Midway Road.

If you have any questions, please contact me at (972) 248-3006. We appreciate the opportunity to provide these services.

Sincerely,

Joseph T. Short, P.E.
Office Manager

Table #1 Right to Left

Summary of Network Measures of Effectiveness (MOE)

Measures of Effectiveness	Existing Conditions			At-grade Alternative			Grade Separated Alternative		
	AM	Noon	PM	AM	Noon	PM	AM	Noon	PM
Delay (veh-hr/hr)	66	60	120	74	77	109	55	55	70
Stops	5,342	5,061	7,239	6,893	6,565	8,204	4,668	4,584	5,665
Fuel Consumption (gal)	181	173	252	191	189	243	159	157	192
CO (kg)	12.64	12.09	17.62	13.35	13.21	16.97	11.09	10.97	13.39
Nox (kg)	2.46	2.35	3.43	2.60	2.57	3.30	2.16	2.14	2.60
VOC (kg)	2.93	2.80	4.08	3.09	3.06	3.93	2.57	2.54	3.10

JP Copy

cc Chris
Mike
Bill
Robin

DRAFT

August 16, 2000

Mr. Jim C. Pierce, P.E.
Assistant City Engineer
Town of Addison
16801 Westgrove Drive
Addison, Texas 75001-9010

Re: Arapaho Road Alignment/Access Study Review

Dear Mr. Pierce:

Per your request, Lee Engineering has performed a review of the Alignment Study Report for Proposed Arapaho Road Extension prepared by HNTB. The recommended configuration of Arapaho Road from the HNTB report includes an overpass over Midway Road with no connection provided for traffic to interchange between Arapaho Road and Midway Road. The primary purpose of this review was to determine if a connection between Arapaho Road and Midway Road would be practical and would allow the Arapaho extension to be more fully utilized.

Based on our review, a connection would increase the utilization of the Arapaho extension. However, the increased utilization would not be enough to warrant the additional cost and right of way impacts of making the connection.

STUDY APPROACH

In reviewing the Alignment Study and the recommended configuration for Arapaho Road the following key steps were taken:

1. Reviewed study reports,
2. Reviewed background data,
3. Collected additional data as needed,
4. Identified and assigned potential diverted trips,
5. Analyzed operations with connections,
6. Eliminated connections that would negatively impact traffic operations,
7. Estimated total diversions of acceptable movements, and
8. Evaluated alternative connection configurations,

This approach was somewhat iterative as total diversions were first estimated and then individual movements were eliminated as connection alternatives were determined to be impractical.

STUDY ASSUMPTIONS

Several key assumptions were made in conducting the analysis. These assumptions include:

1. The projected volume of traffic on the Arapaho extension with no connection to Midway Road is reliable.
2. Any alternative will not include the installation of a traffic signal on Midway Road to serve a connection to Arapaho.
3. Arapaho Road will pass over Midway Road, and any direct connection will be achieved by extending a ramp parallel to Arapaho Road to intersect Midway Road.

Of these assumptions, the second regarding the addition of a signal on Midway Road to serve the connection is probably the most important. The existing signalized intersection of Midway Road at Beltline Road is at or over capacity during several hours every day. Introducing a signal on Midway Road between this intersection and the railroad tracks would create additional operational problems. While the signals could be coordinated to provide for the flow of traffic, any signal installation would introduce more stops and delay to an already congested area.

PREVIOUS REPORTS

As a part of the previous study conducted for this interchange, traffic projections for the Arapaho Road extension were made based on travel demand model runs completed by the North Central Texas Council of Governments (NCTCOG). These projections indicate that without any connection between Arapaho Road and Midway Road the Arapaho extension is expected to carry 13,000 vehicles per day. With the various connection alternatives considered the NCTCOG projection ranged from 6,000 to 28,000 vehicles per day.

Upon further review of the underlying data provided by NCTCOG, we determined a better estimate of future traffic volumes on the Arapaho Road extension with some form of connection in place could be made by reviewing existing count data at area intersections. This review would focus on turning movement volumes that would potentially use the connections provided.

DATA COLLECTION

In an effort to better estimate the number of trips that would be diverted to the Arapaho extension a data collection plan was devised. The area roadway network and area intersections were reviewed to determine the paths from which traffic could be expected to utilize a connection at Midway to divert to the new Arapaho extension. Peak period turning movement counts were collected at the intersections of Beltline at Midway and Beltline at Marsh. These counts and the area roadway network are presented in Figures 1A, 1B, and 1C. This sampling of area intersections served as a basis for estimating diverted traffic volumes.

Figure 1A

Beltline at Midway and Marsh
Intersection Volumes (AM Peak Hour)

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Figure 1B

Beltline at Midway and Marsh
Intersection Volumes (Noon Peak Hour)

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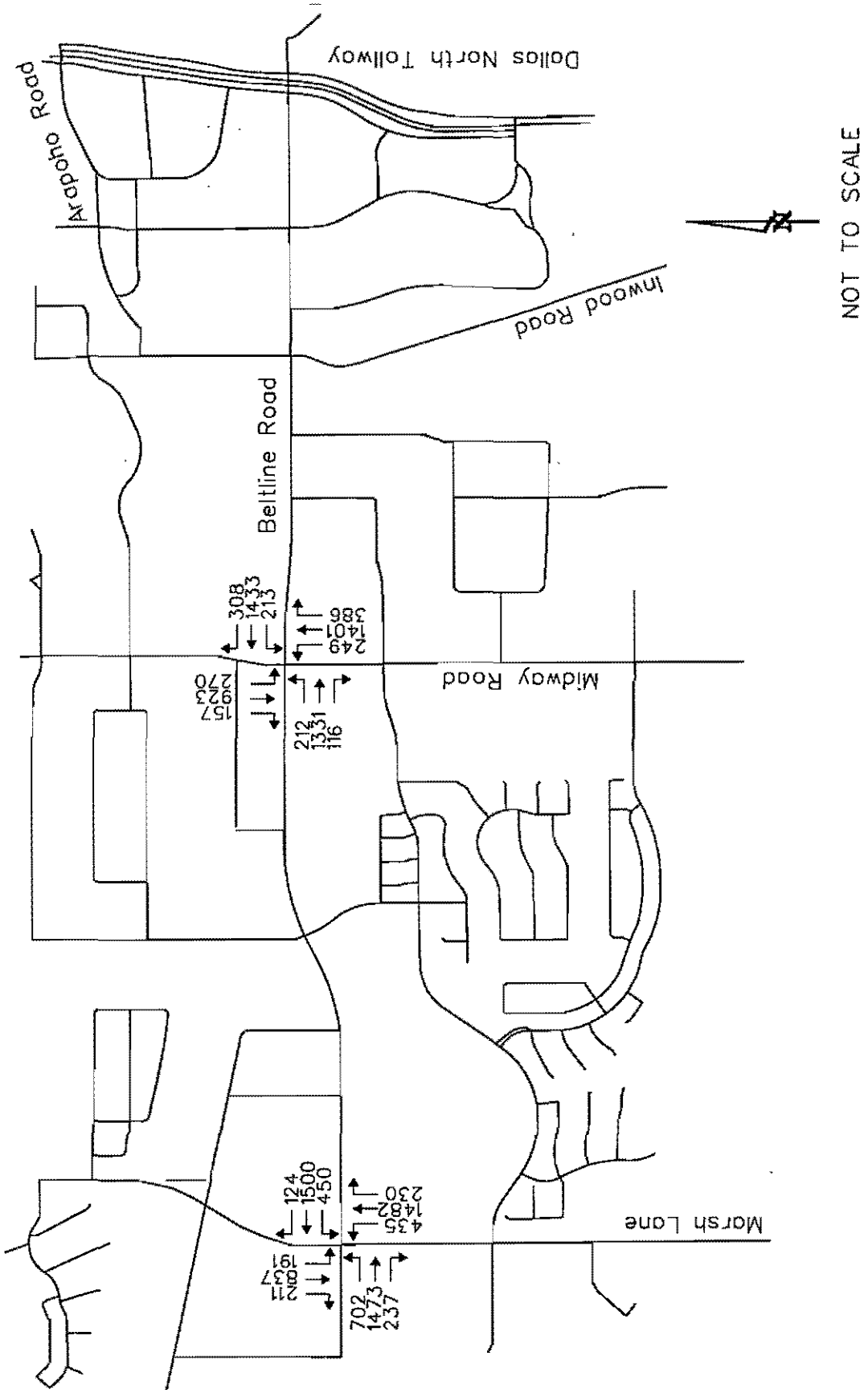


Figure 1C

Beltline at Midway and Marsh
Intersection Volumes (PM Peak Hour)

LEE ENGINEERING

POTENTIAL DIVERTED TRIPS

Estimates were made of the percentages of existing turning movements from adjacent intersections that could be diverted to the new Arapaho Road extension if all possible movements were accommodated in the connection. These percentages were reviewed with Town staff for concurrence. The percentages were then applied to the existing volumes to generate estimates of trips that could potentially be diverted if a connection were provided at Arapaho Road and Midway Road. These estimates and the resulting total intersection volumes for the potential interchange of Arapaho Road and Midway Road are shown on the schematic drawing of the interchange in Figures 2A, 2B, and 2C.

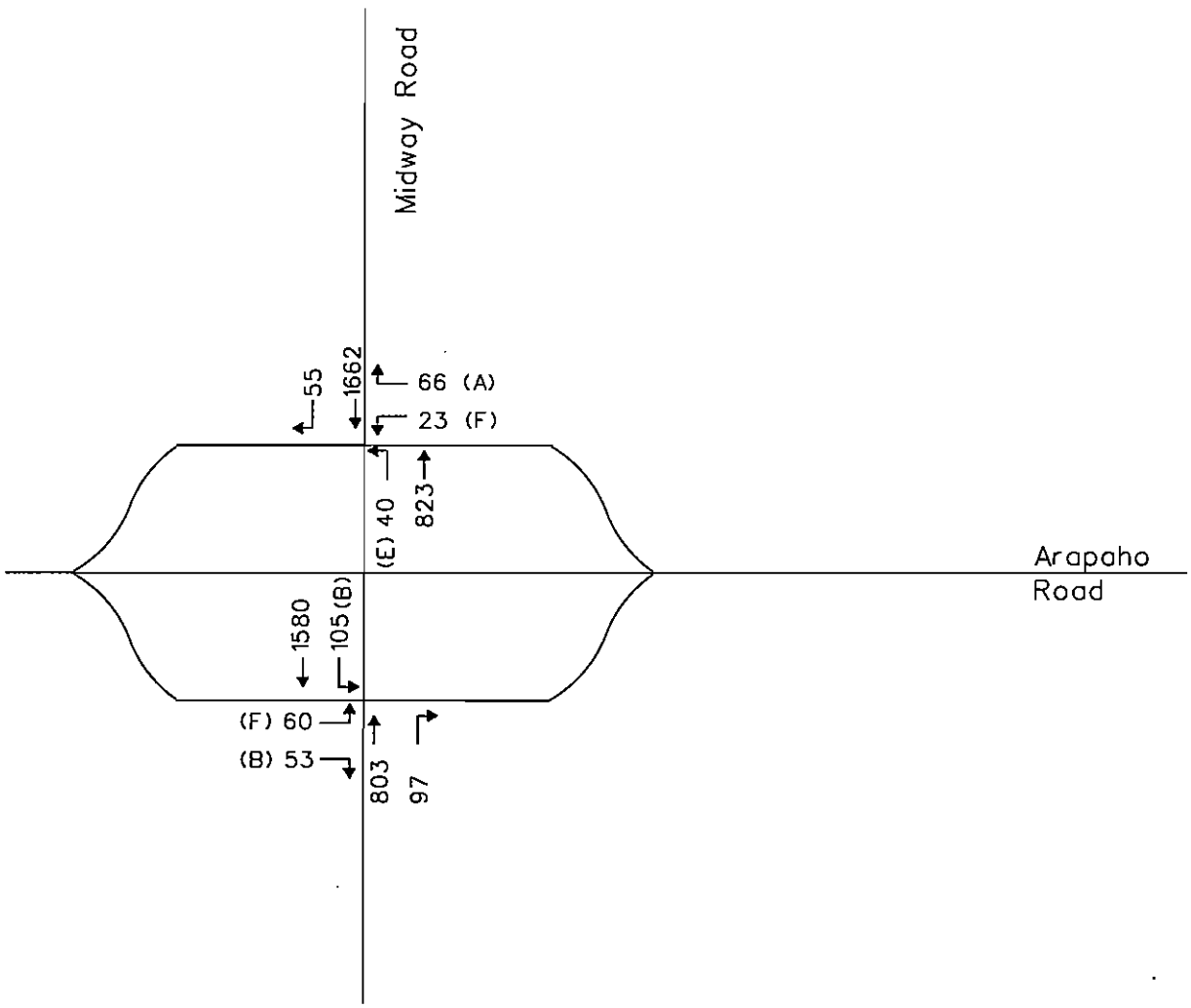
INTERSECTION OPERATIONS

As stated in the study assumptions, after reviewing the existing conditions and the potential interchange configuration, it was determined that providing a traffic signal at this location would have a significant negative impact on traffic operations on Midway Road. Therefore, the intersections on Midway Road with the ramps from Arapaho Road were assumed to operate as unsignalized intersections. Capacity analyses were conducted for each intersection using the Highway Capacity Software. The results of these analyses are presented in Figures 2A, 2B, and 2C and are summarized in Table 1.

As can be seen, several movements would operate at unacceptable levels of service(E or F). Because signalization is not an acceptable option, those movements that are projected to operate at unacceptable levels of service were assumed to be prohibited. Intersection volumes were then adjusted to reflect the prohibition of these movements. The intersections were analyzed with the adjusted volumes to ensure that all movements would operate at acceptable levels of service. These analyses confirmed that the movements that would be allowed would operate at levels of service D of better.

Table 1. Capacity Analysis Results

Intersection	Movement	Level of Service		
		AM Peak	Noon Peak	PM peak
Midway at Westbound Ramps	Westbound Right	A	A	B
	Westbound Left	F	F	F
	Northbound Left	E	D	D
Midway at Eastbound Ramps	Eastbound Right	B	A	A
	Eastbound Left	F	F	F
	Southbound Left	B	C	F



XX - Estimated Volumes
(A) - Level of Service

ENGINEERING

Figure 2A

Arapaho/Midway Intersection
with Ramps (AM Peak Hour)

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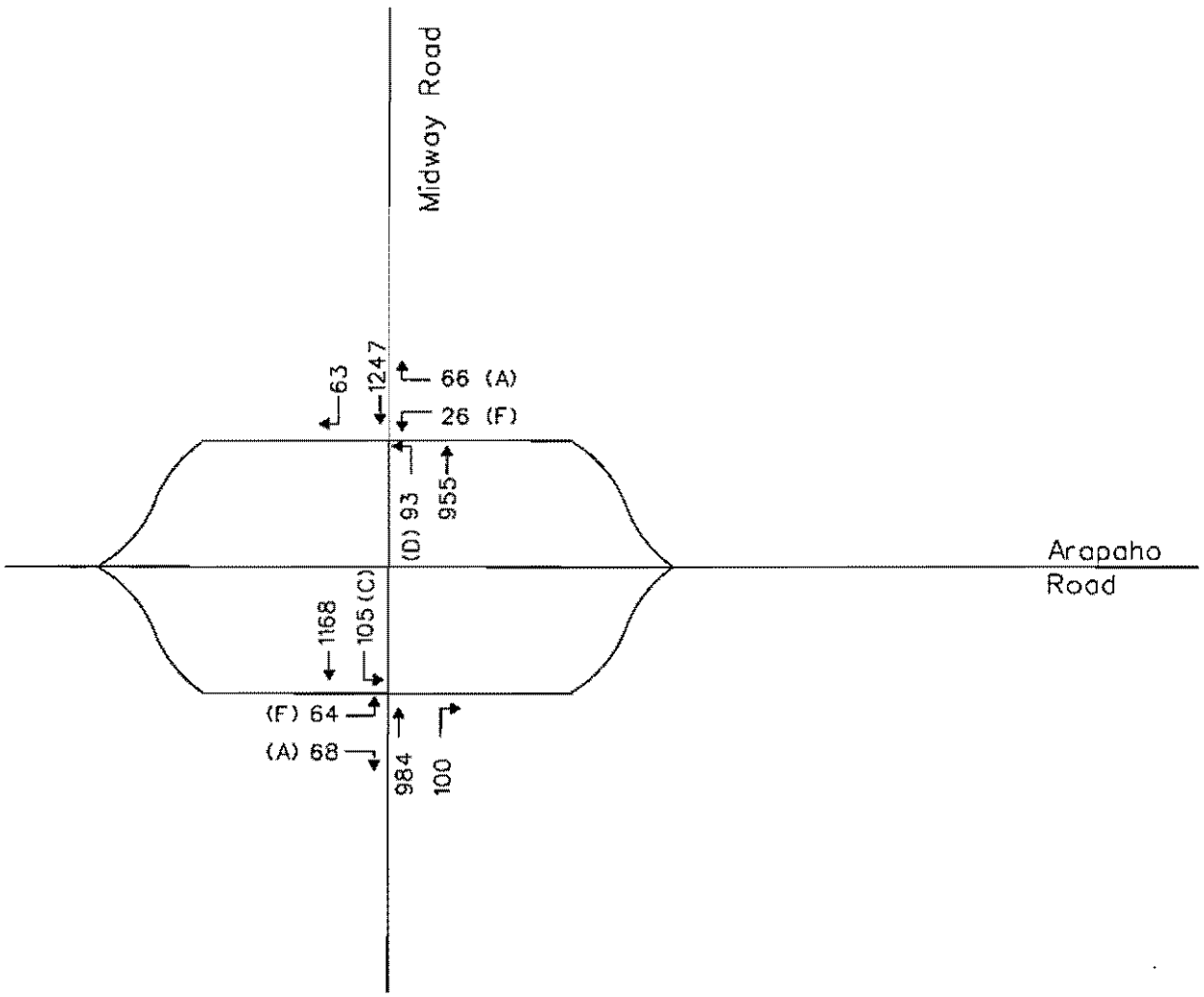

Figure 2B

Arapaho/Midway Intersection
with Ramps (Noon Peak Hour)

ENGINEERING

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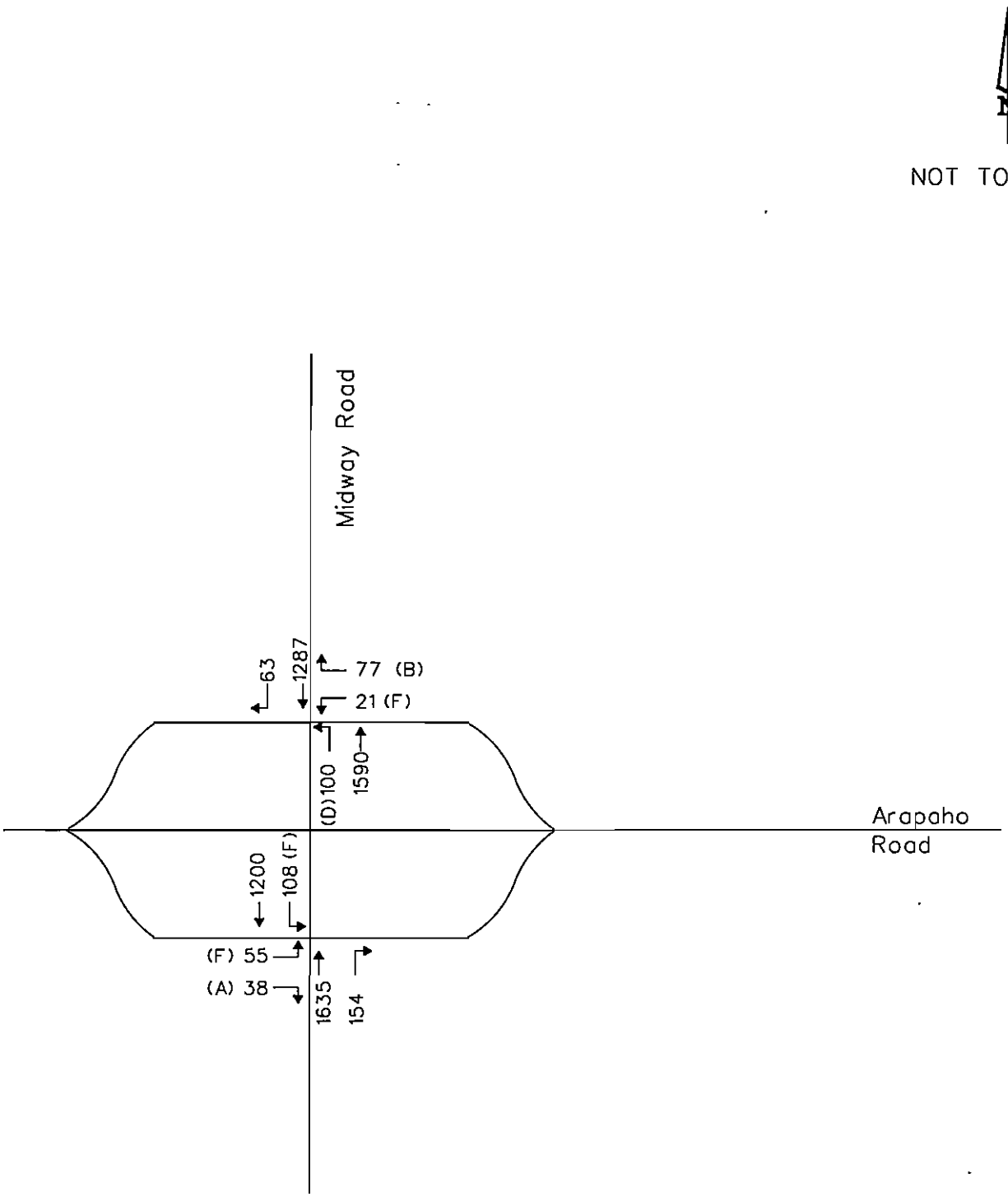

XX - Estimated Volumes
(A) - Level of Service

Figure 2C

Arapaho/Midway Intersection with Ramps (PM Peak Hour)

ENGINEERING

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TOTAL DIVERSIONS

After determining which movements could and could not be accommodated at an unsignalized interchange of Arapaho Road and Midway Road, total daily diverted traffic volumes were estimated. This was accomplished by averaging the peak hour diverted volumes and assuming that this average peak hour represented an industry average of 10 percent of the daily volume on the roadway. The results of these calculations showed total potential additional traffic on the Arapaho Road extension west of Midway Road would be 1,130 vehicles per day and 1,870 vehicles per day east of Midway Road. These numbers represent increases of nine and 14 percent over the projected traffic volumes on Arapaho Road without an interchange.

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The ramps required to complete the connections between the Arapaho Extension and Midway Road will have a significant impact on adjacent properties. Based on our preliminary review, these ramps would require the taking of the Charter Furniture building in the southwest quadrant of the intersection. The ramps would also take more parking area from the property on the southeast corner and eliminate the potential for providing parking for the property under the overpass structure.

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CONCLUSIONS AND RECOMMENDATIONS

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If you have any questions, please contact me at (972) 248-3006. We appreciate the opportunity to provide these services.

Sincerely,

Joseph T. Short, P.E.
Office Manager

Jim Pierce

From: Charles Mitchell
Sent: Wednesday, September 13, 2000 7:40 AM
To: 'jshort@lee-eng.com'
Cc: Jim Pierce
Subject: Belt Line Road Cycle Lengths.

Mr. Short,

Here are the cycle lengths used in our signal system on Be

A.M. Peak 120 Seconds from 7:00 A.M. to 9:30 A.M.
Noon Peak 120 Seconds from 11:00 A.M. to 2:00 P.M.
P.M. Peak 120 Seconds from 4:00 P.M. to 7:00 P.M.
Special Friday P.M. Peak - 130 Seconds from 3:30 P.M. to 7:00 P
Off Peak 104 Seconds

Please note: Belt Line-Midway & Belt Line-Quorum are running in "free-op" due to construction and intersection up

If you have any other question please call me.

Charles M. Mitchell, Signal Tech.
Town of Addison
Street Department

Jim Pierce

From: Bill Shipp
Sent: Friday, August 18, 2000 3:30 PM
To: Jim Pierce
Subject: Arapaho/Midway Study

Jim, thanks for allowing me to comment on the Arapaho/Midway study. My comments are in two areas -- study assumptions and methodology.

I was not involved in the details of framing the study, but I expected the study to consider some options that were taken as assumptions. Specifically, I thought the study would address signalization on Midway and different crossing options -- at grade and below grade. It may be that you were able to narrow Bob Barrett's question to what is possible above grade and no signalization, but I didn't understand that he accepted those assumptions.

As to the methodology, the lay person has to take an awful lot on faith. It presents numbers, talks about diversions, and "grades" diversions, but I have no idea how valid the model is or how these numbers were derived. I don't know whether Bob will accept these numbers on faith or not; I probably would not. If you do except the numbers, then the conclusions are probably solid, but I have no level of confidence. This is to imply nothing about Mr. Short, just that I simply do not know.

Viewed critically, this study provides no more compelling argument for me than the intuition I already had.

Bill

Arapaho/Midway 2nd Opinion 8-29-00

Meeting With Jody Short - Bill Shipp, Jody Jeff & Mike

Discuss @ Council Sept 26th

Bill: Efficiency of Arapaho to divert traffic

Why does Bob Barrett want an intersection @ Midway/Arapaho

How would a surface intersection affect the project.

Should have another draft by Sept 8th

Get with Bob the next week

Need to know by 20th if we go to council.

Use .pdf format for the report; Bill uses .pdf format.

ADDISON CONFERENCE & THEATRE CENTRE

Jody Short 7-31-00

Reviewed HNTB report

Agree with report.

Fly over is recommended

Not very impressed w COC Model

Not intended for our situation

Copy of Parsons Report on SPUI to Jody

HP LaserJet 3100
Printer/Fax/Copier/Scanner

SEND CONFIRMATION REPORT for
Town of Addison
9724502834
Jul-10-00 11:36AM

Job	Start Time	Usage	Phone Number or ID	Type	Pages	Mode	Status
151	7/10 11:29AM	0'00"	99722483855.....	Send.....	0	.....	Remote Fax was Busy..... 961
151	7/10 11:33AM	3'35"	9722483855	Send.....	3/ 3	EC 96	Completed.....

Total 3'35" Pages Sent: 3 Pages Printed: 0

TOWN OF
ADDISON

PUBLIC WORKS

To: Jody Short
Company: Lee Engr
FAX #: 972-248-3855
Date: 7-10-00
# of pages (including cover): 3
Re: Traffic Counts

From: Jim Pierce, P.E.
Assistant City Engineer
Phone: 972/450-2879
FAX: 972/450-2834
jpierce@ci.addison.tx.us

16801 Westgrove
P.O.Box 9010
Addison, TX 75001-9010

☐ Original in mail ☐ Per your request ☐ FYI ☐ Call me

Comments: Attached are our latest traffic counts. We do not have turning movement counts nor can we do them. If you need that data, you will have to do the counts.

Midway/Belt Line is under construction right now. Will be finished soon. You may want to wait until the intersection gets back to normal before you count.

Jim

7-

Town of Addison
1999 Daily Traffic Volume Summary

Street	Location	1999 Daily Traffic Volumes					1989	1993	1998	1999	Difference 1999-1998	% Change From 1998	Count Date
		NB	SB	EB	WB	Total VPD							
Addison Road	South of Belt Line Rd	9793	9838			19631	16440	17958	19073	19631	558	3%	09/08/99
	Belt Line Rd to Arapaho Rd	10422	12694			23116	17490	20949	23370	23116	-254	-1%	09/08/99
	Arapaho Rd to Addison Circle	12221	11083			23304	NR	18526	23431	23304	-127	-1%	09/08/99
	Addison Circle to Airport Pkwy	11055	11847			22902	15826	17505	23260	22902	-358	-2%	09/08/99
	Airport Pkwy to Keller Springs Rd	10417	11075			21492	14884	17130	22034	21492	-542	-2%	09/08/99
	Keller Springs Rd to Westgrove Dr	9488	9951			19439	13491	18076	20097	19439	-658	-3%	09/08/99
	Westgrove Dr to Sojourn Dr	6217	6115			12332	7546	9359	10435	12332	1897	18%	09/01/99
	Sojourn Dr to Trinity Mills Rd	4910	4622			9532	5293	6832	9131	9532	401	4%	09/01/99
Airport Parkway	West of Addison Rd			708	498	1206	1079	1152	1465	1206	-259	-18%	09/01/99
	Addison Rd to Quorum Dr			2803	2316	5119	NR	NR	NR	5119	5119	N/A	09/01/99
	Quorum Dr to Dallas Pkwy			1233	1685	2918	1054	1597	3001	2918	-83	-3%	09/01/99
Arapaho Road	Addison Rd to Quorum Dr			2569	3702	6271	6205	16097	13266	6271	-6995	-53%	09/01/99
	Quorum Dr to Dallas Pkwy			8601	6876	15477	10379	11731	11181	15477	4296	38%	09/02/99
Belt Line Road	West of Marsh Ln			22917	22919	45836	39539	42847	54212	45836	-8376	-15%	08/24/99
	Marsh Ln to Surveyor Blvd			26063	24802	50865	36171	41054	54846	50865	-3981	-7%	09/22/99
	Surveyor Blvd to Midway Rd			24434	22424	46858	36396	40010	52709	46858	-5851	-11%	08/24/99
	Midway Rd to Beltway Dr			32295	27085	59380	41928	54199	59148	59380	232	0%	08/24/99
	Beltway Dr to Addison Rd			28985	30131	59116	44772	52243	69591	59116	-10475	-15%	08/24/99
	Addison Rd to Quorum Dr			29245	26693	55938	42340	49026	68757	55938	-12819	-19%	08/24/99
	Quorum Dr to Dallas Pkwy			29856	28247	58103	40788	44949	66777	58103	-8674	-13%	08/27/99
	Dallas Pkwy to Montfort Dr			23479	23561	47040	37332	42046	49905	47040	-2865	-6%	08/31/99
	Montfort Dr to White Rock Creek			23245	21260	44505	43037	42192	51045	44505	-6540	-13%	09/28/99
Beltway Drive	West of Marsh Ln			3481	3953	7434	5987	6927	7838	7434	-404	-5%	09/09/99
	Marsh Ln to Surveyor Blvd			2424	2685	5109	4500	4346	8909	5109	-3800	-43%	09/09/99
	Surveyor Blvd to Midway Rd			3523	2210	5733	3463	4822	5925	5733	-192	-3%	09/09/99
	East of Midway Rd			2797	2222	5019	3415	4965	5908	5019	-889	-15%	08/25/99
	South of Belt Line Rd	2291	1811			4102	4919	4603	5225	4102	-1123	-21%	08/24/99
Beltwood Parkway	South of Belt Line Rd	1514	1747			3261	2936	2879	3163	3261	98	3%	08/31/99
Brookhaven Club Dr	West of Marsh Ln			5784	5444	11228	7912	9360	12494	11228	-1266	-10%	08/26/99
	Marsh Ln to Spring Valley Rd			6053	6653	12706	8591	11700	12947	12706	-241	-2%	08/31/99
Celestial Road	East of Montfort Dr			430	465	895	NR	642	866	895	29	3%	08/31/99
Dallas Parkway	Quorum Dr to Belt Line Rd	13832	14181			28013	25026	23754	29668	28013	-1655	-6%	08/25/99
	Belt Line Rd to Arapaho Rd	16800	18421			35221	36251	30745	37271	35221	-2050	-6%	08/25/99
	Arapaho Rd to Airport Pkwy	14104	15283			29387	24114	20837	28678	29387	709	2%	08/25/99
	Westgrove Dr to Bent Trails	11971	18013			29984	25002	20108	27488	29984	2496	9%	08/25/99
	Sojourn Dr to Trinity Mills Rd	12736	14219			26955	23770	21004	27105	26955	-150	-1%	08/25/99
Excel Parkway	Westgrove Dr to Addison Rd			852	814	1666	NR	NR	1479	1666	187	13%	08/31/99
Inwood Road	South of Belt Line Rd	9793	9838			19631	16440	17958	19073	19631	558	3%	
Keller Springs Road	West of Addison Rd			3801	3292	7093	NR	NR	NR	7093	7093	N/A	09/28/99
	Addison Rd to Ledgemont Ln			9205	7349	16554	NR	NR	NR	16554	16554	N/A	08/31/99
	Addison Road to Dallas Pkwy.			11598	7827	19425	7942	8916	13292	19425	6133	46%	08/31/99
Landmark Boulevard	Quorum Dr to Belt Line Rd	1290	2469			3759	2466	2962	4011	3759	-252	-6%	08/31/99
Les Lacs Avenue	Beltway Dr to Proton Dr	867	793			1660			2061	1660	-401	-19%	09/09/99
Lindbergh Drive	Billy Mitchell Dr to Midway Rd			1991	2204	4195	NR	NR	5005	4195	-810	-16%	09/08/99
	Midway Rd to Addison Rd			4796	4689	9485	6595	10373	14635	9485	-5150	-35%	09/08/99
Marsh Lane	South of Brookhaven Club Dr	23329	24063			47392	33421	36878	41517	47392	5875	14%	09/02/99
	Brookhaven Club Dr to Spring Valley Rd	22095	23106			45201	35382	32621	35518	45201	9683	27%	08/26/99
	Spring Valley Rd to Beltway Dr	22333	24651			46984	37942	37196	39526	46984	7458	19%	08/26/99
	Beltway Dr to Belt Line Rd	21604	20428			42032	32980	33987	53467	42032	-11435	-21%	09/22/99
	North of Belt Line Rd	20179	24787			44966	31503	34325	46321	44966	-1355	-3%	08/26/99

NA - Not Applicable NR - Not Recorded

Town of Addison
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Street	Location	1999 Daily Traffic Volumes					1989	1993	1996	1999	Difference 1999-1996	% Change From 1996	Count Date
		NB	SB	EB	WB	Total VPD							
Midway Road	Sojourn Dr to Trinity Mills Rd	20612	24078			44690	NR	34108	38782	44690	5908	15%	08/25/99
	Keller Springs Rd to Sojourn Dr	20525	20634			41159	27277	34203	35052	41159	6107	17%	08/25/99
	Lindbergh Dr to Keller Springs Rd	25698	25376			51074	30562	44065	40653	51074	10421	28%	08/25/99
	Belt Line Rd to Lindbergh Dr	22158	25301			47459	29138	40179	41290	47459	6169	15%	08/25/99
	Beltway Dr to Belt Line Rd	21604	21249			42853	35831	43665	44997	42853	-2144	-5%	08/25/99
	Proton Dr to Beltway Dr	25226	23040			48266	37383	47484	52214	48268	-3948	-8%	08/25/99
	Spring Valley Rd to Proton Dr	23041	22271			45312	39699	46836	53779	45312	-8467	-16%	08/25/99
	South of Spring Valley Rd	36242	27427			63669	44042	54508	58805	63669	4864	8%	09/01/99
Montfort Drive	Verde Valley to Sakowitz Dr	7250	8290			15540	15945	NR	NR	15540	15540	N/A	08/25/99
	Sakowitz Dr to Belt Line Dr	8874	5793			14667	12225	15500	17523	14667	-2856	-16%	08/25/99
Paladium Drive	East of Montfort Dr			442	431	873	NR	1358	1015	873	-142	-14%	08/31/99
Pebble Beach	West of Marsh Ln			1416	1511	2927	NR	NR	3012	2927	-85	-3%	09/09/99
Proton Drive	Beltway Dr to Les Lacs Ave	1335	1230			2565	NR	NR	2951	2565	-386	-13%	09/02/99
	Les Lacs Ave to Azure Ln			1636	1453	3089	NR	NR	3033	3089	56	2%	09/09/99
	Azure Ln to Midway Rd			2756	2452	5208	NR	2651	4145	5208	1063	26%	09/09/99
Quorum Drive	Dallas Pkwy to Landmark Blvd			5492	7321	12813	10510	9987	11067	12813	1746	16%	08/26/99
	Landmark Blvd to Belt Line Rd	7973	5328			13301	9271	8739	11390	13301	1911	17%	08/26/99
	Belt Line Rd to Edwin Lewis Dr	6531	5725			12256	8182	10261	10143	12256	2113	21%	08/26/99
	Arapaho Rd to Addison Circle	5584	4360			9944	NR	NR	NR	9944	9944	N/A	09/01/99
	Addison Circle to Airport Pkwy	4158	3540			7698	4769	6262	4274	7698	3424	80%	09/01/99
	Airport Pkwy to Keller Springs Rd	5021	3564			8585	4625	5946	4510	8585	4075	90%	09/01/99
	Keller Springs Rd to Westgrove Dr	1702	2098			3800	2708	3518	3056	3800	744	24%	09/01/99
Realty Road	Marsh Ln to Business Ave			1292	1416	2708	NR	NR	2808	2708	-100	-4%	09/08/99
Runyon Road	North of Belt Line Rd	569	1072			1641	NR	2446	2445	1641	-804	-33%	09/08/99
Sakowitz Drive	Montfort Dr to Belt Line Rd	946	1890			2836	2482	2258	3677	2836	-841	-23%	08/31/99
Sojourn Drive	Midway Rd to Westgrove Dr			5969	6191	12160	7088	10047	11489	12160	671	6%	09/02/99
	Westgrove Dr to Addison Rd			2339	3287	5626	4001	6079	5365	5626	261	5%	09/02/99
	Addison Rd to Dallas Pkwy			805	1558	2363	1073	NR	NR	2363	2363	N/A	08/31/99
Spectrum Drive	Dallas Pkwy to Edwin Lewis Dr	1293	1432			2725	2382	3107	3729	2725	-1004	-27%	08/31/99
Spring Valley Road	Marsh Ln to Brookhaven Club Dr			6964	7462	14426	16254	12349	14071	14426	355	3%	09/09/99
	Brookhaven Club Dr to Midway Rd			11069	12061	23130	12017	21927	23498	23130	-368	-2%	09/02/99
	East of Midway Rd			15259	15579	30838	26536	27902	31194	30838	-356	-1%	09/02/99
Surveyor Boulevard	Beltway Dr to Belt Line Rd	2334	2192			4526	2222	NR	3490	4526	1036	30%	09/09/99
	North of Belt Line Rd	3177	3659			6836	4961	NR	6458	6836	378	6%	09/09/99
Westgrove Drive	Dallas Pkwy to Addison Rd	4371	4478			8849	6291	8055	8528	8849	321	4%	09/02/99
	Addison Rd to Sunbelt Dr	6317	5669			11986	7924	9366	11024	11986	962	9%	09/02/99
	Excel Pkwy to Sojourn Dr	6434	6864			13298	8491	10287	12600	13298	698	6%	09/02/99
	Soujourn Dr to Trinity Mills Rd	5398	4743			10141	5407	6520	8385	10141	1756	21%	09/08/99
Winwood Drive	South of Belt Line Rd	409	465			874	NR	609	664	874	210	32%	08/24/99

NA - Not Applicable NR - Not Recorded

TOWN OF
ADDISON

Public Works / Engineering
16801 Westgrove • P.O. Box 144
Addison, Texas 75001
Telephone: (214) 450-2871 • Fax: (214) 931-6643

LETTER OF TRANSMITTAL

DATE 6-20-00	JOB NO.
ATTENTION	
RE: Arapaho Rd / Midway Intersection	
"2nd Opinion"	

TO Carmen Moran
Town Hall

GENTLEMAN:

WE ARE SENDING YOU ☑ Attached ☐ Under separate cover via _____ the following items:

☐ Shop Drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications

☐ Copy of letter ☐ Change order ☐ _____

COPIES	DATE	NO.	DESCRIPTION
1			Contract for Engineering Services (Traffic Engineering Study of the Proposed Intersection)

THESE ARE TRANSMITTED as checked below:

☐ For approval ☐ Approved as submitted ☐ Resubmit _____ copies for approval

☑ For your use ☐ Approved as noted ☐ Submit _____ copies for distribution

☐ As requested ☐ Returned for corrections ☐ Return _____ corrected prints

☐ For review and comment ☐ _____

☐ FOR BIDS DUE _____ 19____ ☐ PRINTS RETURNED AFTER LOAN TO US

REMARKS for your file

COPY TO _____

SIGNED: _____

If enclosures are not as noted, please notify us at once.

HP LaserJet 3100
Printer/Fax/Copier/Scanner

SEND CONFIRMATION REPORT for
Town of Addison
9724502834
Jun-20-00 10:08AM

Job	Start Time	Usage	Phone Number or ID	Type	Pages	Mode	Status
960	6/20 10:06AM	1'47"	9722483855	Send.....	4/ 4	EC 96	Completed.....

Total 1'47" Pages Sent: 4 Pages Printed: 0

Fax 972-248-3855

TOWN OF ADDISON

Public Works / Engineering
16801 Westgrove • P.O. Box 144-9010
Addison, Texas 75001-9010
Telephone: (214) 450-2871 • Fax: (214) 931-6049
972

LETTER OF TRANSMITTAL

DATE 6-20-00 JOB NO.

ATTENTION

RE: Arapaho / Midway Road Intersection "Z" Option "1"

TO Jody Short
Lee Engineering

GENTLEMAN:
WE ARE SENDING YOU ☒ Attached ☐ Under separate cover via _____ the following items:
☐ Shop Drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change order ☐ _____

COPIES	DATE	NO.	DESCRIPTION
1			Proposal for Traffic Engineering Services

THESE ARE TRANSMITTED as checked below:
☐ For approval ☐ Approved as submitted ☐ Resubmit _____ copies for approval
☒ For your use ☐ Approved as noted ☐ Submit _____ copies for distribution
☐ As requested ☐ Returned for corrections ☐ Return _____ corrected prints
☐ For review and comment ☐ _____
☐ FOR BIDS DUE _____ 19____ ☐ PRINTS RETURNED AFTER LOAN TO US

REMARKS The proposal has been signed by Mike Murphy P.E., Director of Public Works. We would like to have your report by August 14th so it can be put on the agenda August 15th for the August 22nd Meeting. We should have your draft report during the first week of August.

COPY TO Chris Terry
Mike Murphy

SIGNED: Jan Pierce

If enclosures are not as noted, please notify us at once. 972-450-2879

TOWN OF ADDISON

Public Works / Engineering
16801 Westgrove • P.O. Box ~~144~~ 9010
Addison, Texas 75001-9010
Telephone: ~~(214)~~ 450-2871 • Fax: ~~(214) 931-6643~~ 972

LETTER OF TRANSMITTAL

DATE 6-20-00	JOB NO.
ATTENTION	
RE: Arapaho / Midway Road Intersection	
"2nd Opinion"	

TO Jody Short
Lee Engineering

GENTLEMAN:

WE ARE SENDING YOU ☑ Attached ☐ Under separate cover via _____ the following items:

☐ Shop Drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications

☐ Copy of letter ☐ Change order ☐ _____

COPIES	DATE	NO.	DESCRIPTION
1			Proposal for Traffic Engineering Services

THESE ARE TRANSMITTED as checked below:

☐ For approval ☐ Approved as submitted ☐ Resubmit _____ copies for approval

☑ For your use ☐ Approved as noted ☐ Submit _____ copies for distribution

☐ As requested ☐ Returned for corrections ☐ Return _____ corrected prints

☐ For review and comment ☐ _____

☐ FOR BIDS DUE _____ 19____ ☐ PRINTS RETURNED AFTER LOAN TO US

REMARKS The proposal has been signed by Mike Murphy, P.E., Director of Public Works. We would like to have your report by August 14th so it can be put on the agenda August 15th for the August 22nd Meeting. We should have your draft report during the first week of August.

COPY TO Chris Terry
Mike Murphy

SIGNED: _____

If enclosures are not as noted, please notify us at once.

17440 DALLAS PARKWAY
SUITE 204
DALLAS, TEXAS 75287
972•248•3008 FAX 972•248•3855

LEE ENGINEERING

June 13, 2000

Mr. Jim C. Pierce, P.E.
Assistant City Engineer
Town of Addison
16801 Westgrove Drive
Addison, Texas 75001-9010

Re: Arapaho Road Alignment/Access Study Review

Dear Mr. Pierce:

Lee Engineering (LEE) is pleased to submit this letter of agreement to perform traffic engineering services for the Town of Addison. The anticipated product of the effort will be a letter report documenting the results of a review of the Alignment Study Report for Proposed Arapaho Road Extension and a presentation to the Town Council.

SCOPE OF SERVICES

The Scope of Service outlined below illustrates our approach to this project:

Task 1 Data Collection - LEE will gather available studies, reports and graphics prepared by HNTB and others that relate to the alignment and configuration of Arapaho Road between the Addison Road and Marsh Lane. We will review the contents of these materials.

Task 2 Analysis - LEE will closely examine the assumptions and conclusions related to access to Midway Road. We will validate analyses conducted and conduct additional analyses required. These analyses will be limited to the development of projected turning movement and link traffic volumes and analysis of intersection operations and may utilize the CORSIM simulation model. Alternatives that will be examined include an at grade intersection, grade separation with no connection, and grade separation with full or partial connections of Arapaho Road at Midway. Additional analyses may be desirable based on the results obtained.

Task 3 Documentation - LEE will prepare a brief report summarizing our findings and recommendations as they relate to the Arapaho at Midway crossing. This report will be submitted to the City staff for review and comment. A final report will be prepared based on these comments. We will also prepare the necessary graphics to present the results of our review at a meeting of the Town Council.

SCHEDULE AND FEE

We will be prepared to present our results at a council meeting in August. The fee for our services will be billed on an hourly basis according to the attached terms and conditions and will not exceed $12,000 without your approval.

If you have any questions, please contact me at (972) 248-3006. We appreciate the opportunity to provide these services and look forward to working with you on this project. Please sign and return a copy of this letter as a notice to proceed.

Sincerely,

Joseph T. Short, P.E.
Office Manager

Accepted

6/20/2000
Date

Lee Engineering
Terms and Conditions
March 20, 2000

Additional services as authorized by you will be performed at the following rates:

Principal	$165.00/per hour
Project Manager	$130.00/per hour
Project Engineer	$100.00/per hour
Sr. Engineering Designer	$ 90.00/per hour
Engineering Designer	$ 75.00/per hour
Technician	$ 45.00/per hour
Administrative Assistant	$ 60.00/per hour
Secretarial	$ 50.00/per hour
Highway travel	$0.325/mile
Meals, lodging, air fares,	out-of-pocket costs
Reproduction	$0.10/copy

TERMS AND CONDITIONS:

1. Invoices will be submitted monthly.
2. Invoices are due and payable when received.
3. Interest at the rate of 1.5% per month will be applied to invoices not paid within 30 days of initial billing date.
4. We reserve the right to cease work on delinquent accounts.
5. Contracting party is responsible for paying all fees and expenses associated with all activities related to an engagement. Credit will be given for payments received directly from clients of the contracting party or from others.
6. The retainer fee will be credited against fee.
7. In addition to invoices rendered and interest thereon, contracting party agrees to pay any and all legal fees and costs incurred in collecting overdue accounts.
8. Rates are subject to change annually. Work performed in subsequent years will be charged at the adjusted rates.
9. Extra copies of reports will be billed at $10.00 per copy.

5-24-00

Meeting with Jody Short, Lee Engineering

Project Background
- Previous Studies
- Alternatives Examined
- Approved Alignment

Second Opinion on the Intersection of Arapaho and Midway Road
- Provide Preliminary Cost Estimate, Including ROW, for:
  - Bridge Over Midway Road, With/Without Ramps
  - Underpass Under Midway Road, With/Without Ramps
  - Surface Intersection With Midway Road

- Investigate the Impact of a Surface Intersection on:
  - Traffic Flow on Midway Road
  - Traffic Flow on Belt Line Road
  - Traffic Flow on Lindberg Drive
  - Can the Signals at the Above Intersections be Timed Such That Level Of Service Is Not Diminished?

Prepare a report – 2nd meeting in August (22nd)
Report to Council

Loaned Jody Short a copy of Alignment Report.

Meeting with Jody Short, Lee Engineering

Project Background
- Previous Studies
- Alternatives Examined
- Approved Alignment

Second Opinion on the Intersection of Arapaho and Midway Road
- Provide Preliminary Cost Estimate, Including ROW, for:
  - Bridge Over Midway Road, With/Without Ramps
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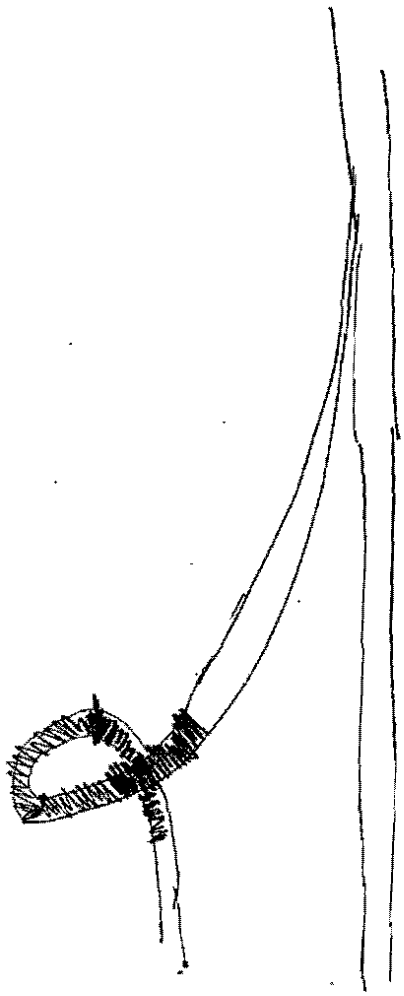
  - Traffic Flow on Midway Road
  - Traffic Flow on Belt Line Road
  - Traffic Flow on Lindberg Drive
  - Can the Signals at the Above Intersections be Timed Such That Level Of Service Is Not Diminished?

1st of
2nd council meeting in August.



17440 DALLAS PARKWAY
SUITE 204
DALLAS, TEXAS 75287
972•248•3006 FAX 972•248•3855

LEE ENGINEERING

March 9, 2001

Mr. Jim C. Pierce, P.E.
Assistant City Engineer
Town of Addison
16801 Westgrove Drive
Addison, Texas 75001-9010

Re: Arapaho Road Alignment/Access Study Review

Dear Mr. Pierce:

This letter is a follow up to our telephone conversation regarding the budget of the project referenced above. I have enclosed our final invoice for this project. This invoice reflect our total costs on this project to $13,780 which is $1,780 in excess of our original contract amount. The additional costs were incurred due to the services we provided that were beyond our original scope of services. These services included the evaluation additional alternative intersection configurations and control identified in meetings with Town staff and council representatives and additional meetings with town staff.

If you have any questions or need more details, please contact me at (972) 248-3006. We appreciate the opportunity to provide these services and have enjoyed working with you and your staff on this project.

Sincerely,

Joseph T. Short, P.E.
Office Manager

TOWN OF ADDISON
PAYMENT AUTHORIZATION MEMO

DATE: 3-14-01 Claim # _____ Check $ 4,490.00

Vendor No. _____

Vendor Name Lee Engineering

Address 3033 N. 44th Street

Address Phoenix

Address AR

Zip Code 85018

INVOICE # OR DESCRIPTION	FUND	DEPT	OBJ	PROJ	SAC	AMOUNT
	(00)	(000)	(00000)	(00000)	(000)	($000,000.00)
Inv. # 14610	41	000	56570	83300		4,490.00

TOTAL $ 4,490.00

EXPLANATION Arapaho Rd, Phase III, "Second Opinion" on intersection of Arapaho Rd and Midway Rd. Final Invoice

Authorized Signature

Finance

3033 N. 44TH STREET
SUITE 375
PHOENIX, ARIZONA 85018
602/955-7206 FAX 602/955-7349

ENGINEERING

February 28, 2001 Invoice Number: 14610

Town of Addison
16801 Westgrove Drive
Addison. TX 75001-9010

Attn: Mr. Jim Pierce

Re: Job T1145.01
Arapaho Road Alignment/Access Study Review

Consulting Services from September 22, 2000 through February 28, 2001

Billing Group: 001

		Contract Maximum:	$13,780.00
		Previous Billings Against Maximum:	$9,290.00
		Current Billings Against Maximum:	$4,490.00
		Balance After This Invoice:	$0.00
Project Manager	29.00 hrs. @	$130.00 /hr.	$3,770.00
Sr. Engineering Designer	8.00 hrs. @	$90.00 /hr.	$720.00
	TOTAL LABOR		$4,490.00

TOTAL AMOUNT DUE $4,490.00

Aged Receivables:				
CURRENT	31-60 DAYS	61-90 DAYS	91-120 DAYS	+120 DAYS
$ 4,490.00	$ 0.00	$ 0.00	$ 0.00	$ 0.00

All invoices are due upon receipt. A late charge of 1.5% will be added to any unpaid balance after 30 days.

Approved: 3-14-01

Final Invoice

TOWN OF ADDISON
PAYMENT AUTHORIZATION MEMO

DATE: _____ **Claim #** _____ **Check $** _____

Vendor No. _____
Vendor Name Lee Engineering
Address 3033 N. 44th Street
Address Phoenix
Address AR
Zip Code 85018

INVOICE # OR DESCRIPTION	FUND	DEPT	OBJ	PROJ	SAC	AMOUNT
	(00)	(000)	(00000)	(00000)	(000)	($000,000.00)
	41	000	56570	83300		

TOTAL _____

EXPLANATION Arapaho Rd Phase III "Second Opinion" on intersection of Arapaho Rd and Midway Rd.

Authorized Signature

Finance

TOWN OF ADDISON
PAYMENT AUTHORIZATION MEMO

DATE: _____ **Claim #** _____ **Check $** _____

Vendor No. _____
Vendor Name Lee Engineering
Address 3033 N. 44th Street
Address Phoenix
Address AR
Zip Code 85018

INVOICE # OR DESCRIPTION	FUND	DEPT	OBJ	PROJ	SAC	AMOUNT
	(00)	(000)	(00000)	(00000)	(000)	($000,000.00)
	41	000	56570	83300		

TOTAL _____

EXPLANATION Arapaho Rd Phase III "Second Opinion" on intersection of Arapaho Rd and Midway Rd.

_____ _____
Authorized Signature Finance

TOWN OF ADDISON
PAYMENT AUTHORIZATION MEMO

DATE: 10-6-00 **Claim #** _____ **Check $** 1,290.00

Vendor No. _____
Vendor Name Lee Engineering
Address 3033 N. 44th Street
Address Phoenix
Address AR
Zip Code 85018

INVOICE # OR DESCRIPTION	FUND	DEPT	OBJ	PROJ	SAC	AMOUNT
	(00)	(000)	(00000)	(00000)	(000)	($000,000.00)
Invoice # 14404	41	000	56570	83300		1,290.00

TOTAL $1,290.00

EXPLANATION Arapaho Rd, Phase III, "Second Opinion" on intersection of Arapaho Rd and Midway Rd.

Authorized Signature

Finance

3033 N. 44TH STREET
SUITE 375
PHOENIX, ARIZONA 85018
602/955-7206 FAX 602/955-7349

LEE ENGINEERING

September 26, 2000 Invoice Number: 14404

Town of Addison
16801 Westgrove Drive
Addison, TX 75001-9010

Attn: Mr. Jim Pierce

Re: Job T1145.01
Arapaho Road Alignment/Access Study Review

Consulting Services from August 19, 2000 through September 15, 2000

Billing Group: 001

		Contract Maximum:	$12,000.00
		Previous Billings Against Maximum:	$8,000.00
		Current Billings Against Maximum:	$1,290.00
		Balance After This Invoice:	$2,710.00
Project Manager	8.00 hrs. @	$130.00 /hr.	$1,040.00
	TOTAL LABOR		$1,040.00

Outside Services

	Outside Service/Subconsultants	$250.00
	TOTAL OUTSIDE SERVICES	$250.00
	TOTAL AMOUNT DUE	$1,290.00

Aged Receivables:

CURRENT	31-60 DAYS	61-90 DAYS	91-120 DAYS	+120 DAYS
$ 1,290.00	$ 0.00	$ 0.00	$ 0.00	$ 0.00

All invoices are due upon receipt. A late charge of 1.5% will be added to any unpaid balance after 30 days.

OK to pay
JP
10-6-00

TOWN OF ADDISON
PAYMENT AUTHORIZATION MEMO

DATE: 9-14-00 Claim # _____ Check $ 6,440.00

Vendor No. _____

Vendor Name Lee Engineering

Address 3033 N. 44th Street

Address Phoenix

Address AR

Zip Code 85018

INVOICE # OR DESCRIPTION	FUND	DEPT	OBJ	PROJ	SAC	AMOUNT
	(00)	(000)	(00000)	(00000)	(000)	($000,000.00)
# 14370	41	000	56570	83300		6,440.00

TOTAL $6,440.00

EXPLANATION Arapaho Rd, Phase III "Second Opinion" on intersection of Arapaho Rd and Midway Rd.

Authorized Signature

Finance

3033 N. 44TH STREET
SUITE 375
PHOENIX, ARIZONA 85018
602/955-7206 FAX 602/955-7349

LEE ENGINEERING

August 31, 2000 Invoice Number: 14370

Town of Addison
16801 Westgrove Drive
Addison, TX 75001-9010

Attn: Mr. Jim Pierce

Re: Job T1145.01
Arapaho Road Alignment/Access Study Review

Consulting Services from July 22, 2000 through August 18, 2000

Billing Group: 001

		Contract Maximum:	$12,000.00
		Previous Billings Against Maximum:	$1,560.00
		Current Billings Against Maximum:	$6,440.00
		Balance After This Invoice:	$4,000.00
Engineering Designer	6.00 hrs. @	$75.00 /hr.	$450.00
Project Manager	44.00 hrs. @	$130.00 /hr.	$5,720.00
Sr. Engineering Designer	3.00 hrs. @	$90.00 /hr.	$270.00
	TOTAL LABOR		$6,440.00

TOTAL AMOUNT DUE $6,440.00

Aged Receivables:

CURRENT	31-60 DAYS	61-90 DAYS	91-120 DAYS	+120 DAYS
$ 6,440.00	$ 0.00	$ 0.00	$ 0.00	$ 0.00

All invoices are due upon receipt. A late charge of 1.5% will be added to any unpaid balance after 30 days.

Approved: OK to pay, J. Pierce 9-14-00

TOWN OF ADDISON
PAYMENT AUTHORIZATION MEMO

DATE: 8-3-00 Claim # _____ Check $ $1,560.00

Vendor No. _____
Vendor Name Lee Engineering
Address 3033 N. 44th Street
Address Phoenix
Address AR
Zip Code 85018

INVOICE # OR DESCRIPTION	FUND	DEPT	OBJ	PROJ	SAC	AMOUNT
	(00)	(000)	(00000)	(00000)	(000)	($000,000.00)
#14306	41	000	56570	83300		1560.00

TOTAL $1,560.00

EXPLANATION Arapaho Rd. Phase III "Second Opinion" on intersection of Arapaho Rd and Midway Rd.

Authorized Signature

Finance

3033 N. 44TH STREET
SUITE 375
PHOENIX, ARIZONA 85018
602/955-7206 FAX 602/955-7349

LEE ENGINEERING

July 28, 2000 Invoice Number: 14306

Town of Addison
16801 Westgrove Drive
Addison, TX 75001-9010

Attn: Mr. Jim Pierce

Re: Job T1145.01
Arapaho Road Alignment/Access Study Review

Consulting Services from June 21, 2000 through July 21, 2000

Billing Group: 001

		Contract Maximum:	$12,000.00
		Previous Billings Against Maximum:	$0.00
		Current Billings Against Maximum:	$1,560.00
		Balance After This Invoice:	$10,440.00
Project Manager	12.00 hrs. @	$130.00 /hr.	$1,560.00
	TOTAL LABOR		$1,560.00

TOTAL AMOUNT DUE $1,560.00

Aged Receivables:				
CURRENT	31-60 DAYS	61-90 DAYS	91-120 DAYS	+120 DAYS
$ 1,560.00	$ 0.00	$ 0.00	$ 0.00	$ 0.00

All invoices are due upon receipt. A late charge of 1.5% will be added to any unpaid balance after 30 days.

Approved: _____ 8-3-00