

Northwest Area Traffic Study
Eastman Corridor
(Full Version including Technical Appendix)

Midland, Michigan

August 31, 2004

Prepared For:

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Executive Summary

The City of Midland retained the services of Reid, Cool & Micahalski, Inc. to review current and projected traffic issues in the northern portion of the City surrounding the Midland Mall area. The average daily traffic (ADT) for Eastman Avenue near the Midland Mall has increased since 1990 at a greater rate than had been projected prior to the Mall development. The 20-year (2010) projected ADT from the 1990 study of Eastman Avenue was exceeded in 2002. Among the various known issues that facilitated this study are: traffic volume increases, rush hour and event related traffic congestion, difficulty with left turning movements, unequal use of traffic lanes, long vehicle back-ups, intersection/signal locations, and the high number of other Eastman Avenue access points.

The study area is bounded by Wackerly Road on the South, Monroe Road on the north, Sturgeon Road on the west and ½ mile east of Jefferson Avenue on the east. The study analysis determined current and forecasted traffic movements and patterns within the study area to determine if intersections are able to control traffic safely and efficiently. Using this information as well as reviewing current observations and planned developments in the geographical area, recommendations were made to help alleviate any current or forecasted problem intersections.

The study required the use of City traffic volume data, current and anticipated developments in the area such as the extension of Airport Road, Letts Road, and Commerce Drive, and a projected growth factor for the area of 0.5%. Sophisticated computer programs utilized this information to help determine current and 20-year projected traffic movements, traffic capacities, traffic vehicle delays, and level of service (LOS) at intersections in this area. The LOS is a rating of an intersection or particular travel lane at an intersection based primarily on average vehicular traffic delay per vehicle. The rating is a scale with rating 'A' indicating no problems to a rating 'F' indicating significant problems. A summary of analysis results and recommendations follows.

Results and Recommendations (Current Traffic):

Eastman Avenue:

Results of the study and related observations have confirmed many of the pre-study observations such as traffic congestion and related motor vehicle problems, due primarily to large volumes of traffic, access locations, and intersection locations as stated above. Traffic has difficulty making left turns into and out of commercial drive entrances on the west side of Eastman Avenue between Airport Road and Joe Mann Boulevard. Also, unequal lane use occurs for southbound Eastman Avenue approaching Airport Road. During observation, approaching traffic experiences large back-ups often in the right, or outside lane while at the same time having the left, or inside lane carry a much smaller volume of traffic during peak travel hours. The analysis determined a LOS of 'C' at the intersection of Eastman Avenue and Airport Road. However, because the program assumes traffic will fill, or queue the travel lanes equally at this intersection, a reasonable determination can be made that the LOS rating is lower than shown in the detailed analysis results, particularly during the afternoon peak traffic.

Installation of a right turn lane north of Airport Road for southbound Eastman Avenue would help alleviate unequal lane use by providing immediate relief of traffic congestion for southbound Eastman Avenue in the short term. For similar reasoning, extending the right turn

lane on southbound Eastman Avenue south of Airport Road to the westbound US-10 on ramp would decrease the potential for unequal lane use and increase traffic efficiency in the short term. In the long term, traffic will experience large back-ups regardless of the right turn lane addition. Therefore, more extensive revisions are needed in the long term.

These interim measures need further review as they would be difficult to implement and likely involves property acquisition.

Other Areas:

The detailed analysis showed that a significant volume of traffic on Wackerly Street approaching Jefferson Avenue during peak hours makes right hand turns onto Jefferson Avenue. Traffic flow at this intersection would be enhanced by installing separate right turn lanes for eastbound and westbound Wackerly Street approaching Jefferson Avenue. This measure will help move through traffic and right turning traffic through the intersection more efficiently so left turning traffic will have more time to make their turns. Also, since the surrounding area at the intersection of Jefferson Avenue and Joe Mann Boulevard is undeveloped, the major movement at this intersection are turning movements, and due to the variation of traffic volumes and patterns, the study recommends researching the effects of installing a roundabout at this location. A roundabout is a complex unsignalized traffic circle with only yield control and no stop control.

Results and Recommendations, (20-Year Projected Traffic):

Results of the study found that 2023 projected traffic volume experience similar, but more extensive, traffic related issues during rush hour periods when compared to existing traffic volumes. Increases in traffic volumes create larger vehicle back-ups and delay. The ability to make left turn movements will be further reduced and vehicle congestion will likely increase for traffic at intersections along Eastman Avenue. The existing signalized intersections will not be able to adequately handle projected traffic volumes. Unsignalized intersections in the area will also experience increases in traffic volumes requiring signalization and intersection widening.

Eastman Avenue:

Of the Eastman Avenue improvement options reviewed to meet the forecasted 2023 traffic demand, this report recommends that the City of Midland research and develop plans to reconstruct Eastman Avenue as a boulevard from US-10 to a point north of Joe Mann Boulevard. It would be a benefit to improve traffic movements at any time, so implementation of this option could occur at any time between now and 2023. See Figure 3.1 through 3.3 .

Implementing a boulevard would require all left turn movements to be made using strategically located U-turn crossovers. This would require right turns out of driveways or streets and then making a left turn at the nearest U-turn to head in the opposite direction. Concurrently, the City should work with the MDOT to determine if the State is willing to allow a direct connection from the westbound US-10 off ramp to the Midland Mall. Coordination with the Midland Mall is also necessary. This connection should be provided in order to eliminate the US-10 off ramp to Midland Mall movement using the signalized intersection at Eastman Avenue and reduce the potential for ramp traffic to back up onto the freeway. The software program confirms that these improvements could handle the forecast 2023 traffic volumes.

Other Areas:

Future recommendations require widening and signalization of the intersections at Wackerly Street / Sturgeon Avenue, Airport Road / Sturgeon Avenue, Jefferson Avenue / Monroe Road and the Joe Mann Boulevard / Wal-Mart/Home Depot driveway. It is also recommended that the intersections on Sturgeon Avenue at Wackerly Street and Sturgeon Avenue at Airport Road be relocated farther from US-10, if economically feasible. The Joe Mann/Wal-Mart intersection would require extensive meetings and coordination with the Midland Mall. If further research indicates placement of a roundabout at the Jefferson Avenue/Joe Mann Boulevard intersection will function well, then this should be implemented prior to development of surrounding properties. Otherwise, recommend adding left turn signals at this intersection to accommodate the projected traffic volumes. As traffic volumes are dynamic or changing through time, gathering periodical traffic count data in the future will help identify when these improvements will become necessary.

Introduction

The City of Midland retained the services of Reid, Cool & Micahalski, Inc. to evaluate the existing and proposed traffic volumes, patterns and capacities within the study area. The study area is bounded by Wackerly Road on the South, Monroe Road on the north, Sturgeon Road on the west and ½ mile east of Jefferson Avenue on the east. This study is designed to provide recommendations to relieve traffic congestion and improve traffic flow within the area. Recommendations take into consideration the entire northwest commercial area as to prevent shifting traffic problems to other locations in the area. Among the various known issues that facilitated this study are: traffic volume increases, rush hour and event related traffic congestion, difficulty with left turning movements, unequal use of traffic lanes, long vehicle back-ups, intersection/signal locations, and the high number of other Eastman Avenue access points.

The northwest part of Midland, north of the US-10 freeway, is an area of continued growth and development with resultant increasing traffic volumes. This study analyzes this growth and development by determining current and forecasted traffic movements and patterns within the study area to see if intersections are failing to control traffic safely and efficiently. Using this analysis information along with reviewing current observations and planned developments in the geographical area, recommendations were made to help alleviate any current or forecasted problem intersections.

The average daily traffic (ADT) for Eastman Avenue near the Midland Mall has increased since 1990 at a greater rate than had been projected prior to the Mall development. The 20-year (2010) projected ADT from the 1990 study of Eastman Avenue was exceeded in 2002. Eastman Avenue, which runs from downtown Midland north to Baker Road, carries significant levels of daily traffic in the vicinity of the Midland Mall. Substantial retail development is located on both sides of Eastman Avenue, just north of US-10. In addition, the Jack Barstow Airport and the Midland County Fairgrounds are located on the west side of Eastman Avenue in this area.

Historical data has shown that daily traffic volumes have been sharply reduced north of the Meijer's store. Therefore the majority of the high volume traffic occurs on Eastman Avenue in the half mile between Wackerly Street and Joe Mann Boulevard. There are four traffic signals between Wackerly Street to Joe Mann Boulevard. The southernmost signal controls the intersection of Eastman Avenue and Wackerly Street (just south of the US-10 freeway). The second signal controls the intersection of Eastman Avenue with the US-10 westbound off ramp and Airport Road. The third signal controls the intersection of Eastman Avenue and the southern Midland Mall exit and entrance. The fourth signal controls the intersection of Eastman Avenue with Joe Mann Boulevard (which provides access to the Midland Mall, the Meijer's store, Kohls and Wal-Mart stores, the Midland Cinemas, as well as other retail planned for the area).

One of the most significant traffic problems occurs at the intersection of Eastman Avenue with Airport Road / US-10 Off Ramps, particularly the southbound traffic. As southbound traffic backs up from this intersection, traffic movements into and out of the driveways on the western side of Eastman Avenue become difficult to accomplish. When actuated, the protected left-turn arrow for northbound left-turns into Airport Road also serves to take green time away from other movements.

Vehicles waiting to turn out of the Midland Mall also begin to back up into the Mall, if traffic along Eastman Avenue cannot be processed by the Airport Road intersection. This problem could also interfere with northbound traffic along Eastman Avenue if traffic from the Mall tries to turn onto southbound Eastman Avenue without adequate room.

The City of Midland has done an excellent job in coordinating the timings of these traffic signals to maximize the efficiency of traffic flow along Eastman. Nevertheless, the four traffic signals as well as the concentration of retail and other traffic in this area makes traffic flow along Eastman Avenue sluggish during peak times. Identifying possible ways to mitigate the traffic congestion throughout this corridor is the focus of this traffic study.

Street Descriptions

Eastman Avenue, near the Midland Mall, is essentially five lanes wide until it narrows to two lanes north of the Meijer's store. Along the eastern side of Eastman Avenue, there are additional right-turn deceleration lanes at each of the mall entrances, Joe Mann Boulevard and the entrances to Meijer's. There is also a long deceleration lane for northbound traffic entering the Westbound US-10 On-ramp. Eastman Avenue has been widened to five lanes from Joe Mann Boulevard north to Commerce Drive (which may become part of a future Letts Road extension).

The west side of Eastman Avenue contains a variety of uses, including a motel, restaurants, the Midland County Fairgrounds, Lowes, and Office Max on a number of different parcels. There are numerous curb cuts on the west side of Eastman Avenue, none of which are served by a right-turn deceleration lane. There is a right-turn lane, however, for southbound Eastman Avenue at Wackerly Street that begins at the Westbound US-10 On-ramp.

Monroe Road on the northern edge of the study is two lanes wide with a traffic signal at its intersection of Eastman Avenue. Right turn lanes have been added to the Monroe Road / Eastman Avenue intersection. Monroe Road ends at Sturgeon Avenue to the west and their intersection is controlled by a stop sign. To the east, Monroe Road intersects Jefferson Avenue at a four-way stop controlled intersection. Currently Monroe Road does not carry a very significant volume of traffic.

Sturgeon Avenue located one mile west of Eastman Avenue is primarily two lanes wide. The intersections of Sturgeon Avenue with Wackerly Street and Airport Road are controlled by a four-way stop, Sturgeon Avenue traffic can flow unimpeded past Monroe Road and Letts Road. Letts Road and Monroe Road traffic must stop for Sturgeon Avenue.

Jefferson Avenue is two lanes wide, north of Joe Mann Boulevard; three lanes from Joe Mann Boulevard to south of the study area. There is a traffic signal located at the intersections of Jefferson Avenue with both Wackerly Street and Joe Mann Boulevard / Joseph Drive. Similar to Eastman Avenue, traffic volumes drop off significantly on Jefferson Avenue north of Joe Mann Boulevard. Jefferson Avenue has a center left turn lane at Joe Mann Boulevard and Wackerly Street. Jefferson Avenue is scheduled to be widened from two-lanes to three lanes from Joe Mann Boulevard northerly to Letts Road.

Wackerly Street is three lanes wide between Eastman Avenue and Jefferson Avenue, and four lanes wide (two lanes eastbound, one lane westbound with a center left-turn lane) between the

eastbound US-10 ramps and Eastman Avenue. West of the freeway ramps, Wackerly Street narrows to two lanes.

Joe Mann Boulevard runs from Eastman Avenue to Jefferson Avenue servicing the retail uses in and around the Midland Mall. East of Jefferson Avenue, Joe Mann Boulevard becomes Joseph Drive. Joseph Drive is two lanes wide with significant left-turns at its approach to Jefferson Avenue. Joe Mann Boulevard is striped as two lanes plus a center turn lane at significant driveways and is a four lane boulevard at Eastman Avenue. In addition, a center turn lane and an eastbound right turn lane are present at Jefferson Avenue.

Letts Road currently runs from Stark Road to Perrine Road, where Letts Road shifts to the south between Sturgeon Avenue and Perrine Road. Letts Road ends at Sturgeon Avenue. Letts Road begins again at Jefferson Avenue and continues to the east of Waldo Road. There have been discussions of a Letts Road extension from Jefferson Avenue to Eastman Avenue, and possibly further west to Sturgeon Avenue to help provide an alternative east-west route. Letts Road does not carry a significant amount of traffic at this time at its intersection with Jefferson Avenue.

Airport Road will be extended from Hicks Road to Stark Road, west of Sturgeon Avenue. Stark Road is expected to become a major route between US-10 and M-20 at some point in the future. The Airport Road extension is likely to draw some traffic that currently uses US-10 and provide an additional and more direct route to the west and southwest than the current street system allows.

Data Collection

The City of Midland provided traffic counts for the following intersections.

- Sturgeon Avenue at Wackerly Street, Airport Road, and Monroe Road
- Eastman Avenue & Wackerly Street
- Eastman Avenue & US-10 Northbound to Eastbound On Ramp
- Eastman Avenue & US-10 Southbound to Westbound On Ramp
- Eastman Avenue & Airport Road / US-10 Westbound Off Ramps
- Eastman Avenue & Southern Mall Entrance
- Eastman Avenue & Southern Mall Exit/Entrance (North of Burger King)
- Eastman Avenue & Mid Mall Exit/Entrance (North of Toys R US)
- Eastman Avenue & Joe Mann Boulevard
- Eastman Avenue & Monroe Road
- Jefferson Avenue & Wackerly Street
- Jefferson Avenue & Diamond
- Jefferson Avenue & Joe Mann Boulevard
- Jefferson Avenue & Letts Road
- Jefferson Avenue & Monroe Road
- Wackerly Street & US-10 Eastbound Off Ramps / Eastbound US-10 On Ramps

The peak traffic hours occurred from 9:00-10:00 AM, 12:00-1:00 PM, and 4:45-5:45 PM. The existing traffic volumes are illustrated on Figures 1a and 1b, which are attached to this report as well as included in the technical appendix of this study.

Traffic Growth

A blanket growth factor of 0.5% per year was applied to the existing traffic volumes for 20 years to estimate the traffic growth in the area not taken directly into account in this traffic study. It is understood that at the time of this report, Midland's overall growth is about 0.4% in the current decade beginning in 2000. This blanket growth factor increases the traffic volumes by approximately 10.5% in the twenty years and is based upon input received from the City of Midland that indicated that growth outside the Midland Urban Growth Area would be relatively low.

In addition to the blanket growth factor, there are several developments that were assumed to be constructed by the year 2023. The developments that were taken directly into consideration in this report are as follows:

- Courts of Joseph Drive - north of Joseph Drive, east of Jefferson Avenue, 36 single family homes
- Broadhead Estates- south of Julie Ann, east of Jefferson Avenue, 89 single family homes
- Oakbrook Estates – east of Oakbrook Court, east of Jefferson Avenue, 6 single family homes
- Winding Creek Estates – east of Perrine Road, north of Letts Road, west of Sturgeon Avenue, 75 single family homes
- Alpine Estates – east of Perrine Road, south of Letts Road, west of Sturgeon Avenue, 120 mobile homes
- Perrine Estates – west of Perrine, south of Letts Road, west of Sturgeon Avenue, 60 single family homes
- Somerset Pines – west of Perrine Road, north of Airport Road, 60 single family homes
- Letts Extension – Letts Road between Jefferson Avenue and Eastman Avenue, 240 acres of single family homes
- Mirror of Midland Place II – Joe Mann Boulevard, west of Jefferson Avenue, 120,000 sq.ft of retail space. This development would be similar in size to the current Midland Place II development, which includes, Kohl's, Marshals, Michaels, and MC Sports.
- Home Depot – Joe Mann Boulevard, east of Eastman Avenue, 127,000 sq.ft. home improvement superstore
- Best Buy – Joe Mann Boulevard, east of Eastman Avenue, 40,000 sq.ft retail space
- Barstow Retail – Airport Road, east of Sturgeon Avenue, 200,000 sq.ft of retail space.
- Wal-Mart Expansion – Joe Mann Boulevard, east of Eastman Avenue, 72,000 sq.ft of additional retail space

Trip generation for the forecast development in the area was done using the Institute of Transportation Engineer's (ITE) Trip Generation Manual. A complete summary of the morning and afternoon peak hour trip generation results as well as the twenty-four hour volume is included in the technical appendix. Table 1 shows the trip generation for each of the developments.

Trip distribution for these various developments was based somewhat on traffic volumes in the area. The traffic from each of these specific sites were only added into the afternoon peak hour volumes, since the ITE Trip Generation Manual only provides traffic data estimates for the peak hours of the day which range from 7:00-9:00 AM and 4:00-6:00 PM. Since trip generation

Table 1 - Trip Generation

Site Use	Size	24-Hr Volumes	A.M. Peak Trips		P.M. Peak Trips	
			Enter	Exit	Enter	Exit
Courts of Joseph Drive	36	345	7	20	23	13
Broadhead Estates	89	852	17	50	58	32
Oakbrook Estates	6	57	1	3	4	2
Winding Creek Estates	75	718	14	42	49	27
Alpine Estates	120	577	10	38	42	25
Perrine Estates	60	574	11	34	39	22
Somerset Pines	60	574	11	34	39	22
Letts Extension Residential	240 acres	6,250	154	341	434	223
Midland Place II	120,000	5,150	76	48	216	233
Home Depot	127,000	1,717	102	86	171	193
Best Buy	40,000	4,451	25	16	72	78
Barstow Retail	200,000	8,584	126	80	360	388
Wal-Mart Expansion	72,500	3113	46	29	131	141
Total			600	821	1638	1399

information is not available for the mid morning peak of 9:00-10:00 AM and the noon peak hour of 12:00-1:00 PM, traffic generated by the sites listed in Table 1 were therefore not included in the mid-morning and noon peaks. These peak periods were chosen as the periods that commercial traffic is at its heaviest. The forecast year 2023 peak volumes are shown on Figures 2a and 2b.

The traffic generated by these forecasted developments for the afternoon peak hour should be taken as a conservative and worst case traffic scenario for the area. No volume deductions were taken for pass-by traffic and shared trips between the newly proposed retail and the existing retail in the area. Some patrons may be visiting a number of the stores in one particular trip, thereby somewhat reducing the overall traffic demand in the area.

Capacity Analysis

Capacity analyses were done using the TSIS software developed for the FHWA, which is based upon the Highway Capacity Manual 1997 edition. This program takes an entire network of roads into consideration rather than analyzing each intersection as a single entity. Therefore each intersection impacts the way traffic flows in this area.

The TSIS model includes the major intersections along Sturgeon Avenue, Eastman Avenue, and Jefferson Avenue from Wackerly Street to Monroe Road, the intersections listed under the Data Collection section of the report.

Because of inherent imbalances in traffic volumes between the various intersections of the study, assumptions had to be made to balance the traffic volumes. These volume discrepancies, that vary from large to small, can be accounted for either by drivers leaving the street system by turning into an uncounted driveway or the fact that traffic counts were taken on different days with slightly different results. Regardless of the cause, the traffic volumes needed to be balanced (modified to ensure that vehicles don't disappear) for the model.

Since Eastman Avenue is the primary source of concern for this traffic study, data along Eastman Avenue near Wackerly Street and the Midland Mall was projected outward to the other intersections so that the traffic at the outside edge of the traffic study will be significantly higher than the existing volumes indicate. This methodology is designed to give Eastman Avenue the highest degree of accuracy but tends to create a lower degree of accuracy for the external

intersections, since this extra traffic will not necessarily be there in the future. Since traffic is dynamic and can vary, worst case scenarios will help ensure that external intersections will handle projected 2023 traffic. Periodic traffic studies will provide the most accurate traffic volumes and help determine trends and recommended improvements.

The following tables (Tables 2 through 15) will show the overall capacity analysis results for the major intersections of the study, and, as mentioned previously, the more detailed tables can be found in the technical appendix. Each table shows the existing and forecast (year 2023) volumes, the average intersection delay and the Level of Service (LOS) for the three analyzed peaks. LOS A-is considered the best road condition (indicating little average vehicle delay per hour being examined) and LOS F is the worst (indicating significant average vehicle delay per hour). LOS criteria breakdown for signalized and unsignalized intersections are included in the appendix. Because the capacity analysis tables in this section of the report are the averaged results, some traffic movements that operate poorly, such as some left turning movements, are balanced by traffic movements that operate well. Specific delays for various turning movements can be found in the technical appendix.

Obviously, when traffic is heavy and where it has a choice, it will seek routes where it can more easily enter the traffic stream (often with a traffic signal). Thus, unsignalized locations such as at the Midland Mall center driveway show better LOS than would logically be present because motorists often experience difficulty making a left-turn out of unsignalized driveways during the peak hour and have chosen to use the adjacent signalized driveway instead.

**Table 2 – Signalized Capacity Analysis Results
Eastman Avenue & Wackerly Street**

Intersection	Existing 2003 Peak Hour Volumes			Forecast 2023 Peak Hour Volumes		
	Morning	Noon	Afternoon	Morning	Noon	Afternoon
Volume	2322	3410	3387	2566	3769	4497
Delay	24.6	33.3	30.9	26.1	45.0	33.7
LOS	C	C	C	C	D	C

**Table 3 – Signalized Capacity Analysis Results
Eastman Avenue & Airport Road / US-10 Off Ramps**

Intersection	Existing 2003 Peak Hour Volumes			Forecast 2023 Peak Hour Volumes		
	Morning	Noon	Afternoon	Morning	Noon	Afternoon
Volume	1924	3434	3608	2125	3795	5319
Delay	14.5	19.6	21.2	17.2	26.7	55.2
LOS	B	B	C	B	C	E

**Table 4 – Signalized Capacity Analysis Results
Eastman Avenue & Mall Exit/Entrance South (north of Burger King)**

Intersection	Existing 2003 Peak Hour Volumes			Forecast 2023 Peak Hour Volumes		
	Morning	Noon	Afternoon	Morning	Noon	Afternoon
Volume	1325	2507	2429	1348	2770	3589
Delay	5.7	10.1	9.4	5.8	9.9	93.7
LOS	A	B	A	A	A	F

**Table 5 – Unsignalized Capacity Analysis Results
Eastman Avenue & Center Mall Exit/Entrance**

Intersection	Existing 2003 Peak Hour Volumes			Forecast 2023 Peak Hour Volumes		
	Morning	Noon	Afternoon	Morning	Noon	Afternoon
Volume	1217	2164	2129	1346	2392	3258
Delay	1.8	2.3	2.4	1.7	2.4	28.5
LOS	A	A	A	A	A	D

**Table 6 – Signalized Capacity Analysis Results
Eastman Avenue & Joe Mann Boulevard**

Intersection	Existing 2003 Peak Hour Volumes			Forecast 2023 Peak Hour Volumes		
	Morning	Noon	Afternoon	Morning	Noon	Afternoon
Volume	1234	2172	2185	1365	2400	3644
Delay	7.6	10.4	10.9	7.0	10.9	48.0
LOS	A	B	B	A	B	D

**Table 7 – Signalized Capacity Analysis Results
Eastman Avenue & Monroe Road**

Intersection	Existing 2003 Peak Hour Volumes			Forecast 2023 Peak Hour Volumes		
	Morning	Noon	Afternoon	Morning	Noon	Afternoon
Volume	516	697	1127	569	793	1487
Delay	10.2	8.7	12.8	8.6	7.9	11.9
LOS	B	A	B	A	A	B

**Table 8 – Unsignalized Capacity Analysis Results
Sturgeon Avenue & Wackerly Street**

Intersection	Existing 2003 Peak Hour Volumes			Forecast 2023 Peak Hour Volumes		
	Morning	Noon	Afternoon	Morning	Noon	Afternoon
Volume	816	792	1034	1069	876	1512
Delay	15.1	8.85	13.9	15.7	10.0	144.7
LOS	C	A	B	C	B	F

**Table 9– Unsignalized Capacity Analysis Results
Sturgeon Avenue & Airport Road**

Intersection	Existing 2003 Peak Hour Volumes			Forecast 2023 Peak Hour Volumes		
	Morning	Noon	Afternoon	Morning	Noon	Afternoon
Volume	453	579	806	501	641	1449
Delay	12.7	11.0	28	12.5	11.0	197.5
LOS	B	B	D	B	B	F

**Table 10 – Unsignalized Capacity Analysis Results
Sturgeon Avenue & Monroe Road**

Intersection	Existing 2003 Peak Hour Volumes			Forecast 2023 Peak Hour Volumes		
	Morning	Noon	Afternoon	Morning	Noon	Afternoon
Volume	282	337	731	313	373	909
Delay	3.35	4.1	6.0	3.33	4.2	4.7
LOS	A	A	A	A	A	A

**Table 11 – Signalized Capacity Analysis Results
Wackerly Street & US-10 Ramps**

Intersection	Existing 2003 Peak Hour Volumes			Forecast 2023 Peak Hour Volumes		
	Morning	Noon	Afternoon	Morning	Noon	Afternoon
Volume	755	754	842	834	833	1583
Delay	12.6	12.4	12.5	11.9	11.8	12.5
LOS	B	B	B	B	B	B

**Table 12 – Signalized Capacity Analysis Results
Jefferson Avenue & Wackerly Street**

Intersection	Existing 2003 Peak Hour Volumes			Forecast 2023 Peak Hour Volumes		
	Morning	Noon	Afternoon	Morning	Noon	Afternoon
Volume	1250	1832	1862	1314	2025	2762
Delay	14.1	15.3	19.6	12.6	16.4	79.4
LOS	B	B	B	B	B	E

**Table 13 – Signalized Capacity Analysis Results
Jefferson Avenue & Joe Mann Boulevard**

Intersection	Existing 2003 Peak Hour Volumes			Forecast 2023 Peak Hour Volumes		
	Morning	Noon	Afternoon	Morning	Noon	Afternoon
Volume	791	1397	1538	874	1543	2604
Delay	9.9	12.5	14.4	9.3	10.4	55.6
LOS	A	B	B	A	B	E

**Table 14 – Unsignalized Capacity Analysis Results
Jefferson Avenue & Letts Road**

Intersection	Existing 2003 Peak Hour Volumes			Forecast 2023 Peak Hour Volumes		
	Morning	Noon	Afternoon	Morning	Noon	Afternoon
Volume	402	577	736	514	637	1338
Delay	3.2	.9	1.4	2.8	1.3	3.2
LOS	A	A	A	A	A	A

**Table 15 – Unsignalized Capacity Analysis Results
Jefferson Avenue & Monroe Road**

Intersection	Existing 2003 Peak Hour Volumes			Forecast 2023 Peak Hour Volumes		
	Morning	Noon	Afternoon	Morning	Noon	Afternoon
Volume	322	732	1084	354	809	1375
Delay	7.9	11.3	22.9	7.1	12.1	74.2
LOS	A	B	C	A	B	E

General Comments on Computer Simulation (TRAF-NETSIM) Results

A brief discussion of each of the capacity analyses follows. Cases 1 through 3 are for the existing (2003) volumes on the existing roadway system. Cases 4 through 6 are for the forecast (2023) volumes on the existing roadway system. Currently southbound Eastman Avenue approaching Airport Road has unequal lane use during peak hours. Therefore, a reasonable determination can be made that the LOS rating results are lower than shown in the detailed

analysis because the simulation assumes traffic will fill, or queue the travel lanes equally at intersections, particularly during the afternoon peak traffic.

Case 1 – Existing 2003 Morning Peak Hour Volumes, 9:00-10:00 AM.

During the existing morning peak hour, traffic appears to be flowing smoothly at all of the intersections within the area. The two intersections of Eastman Avenue with Wackerly Street and with Airport Road / US-10 Off Ramps are functioning at an overall level of service “C” and “B” respectively without significant queuing at those intersections.

All of the other intersections within the study area are operating with an overall level of service “C” or better.

Case 2 – Existing 2003 Noon Peak Hour Volumes, 12:00-1:00 PM.

During the existing noon peak hour, traffic volumes are higher than during the morning peak hour. While the levels of service are similar to that of the morning peak hour, level of service “C” or better at each intersection, delays are generally longer at each intersection and queues tend to increase. In reality, some congestion is experienced along Eastman Avenue during the noon peak hours, which is due to factors including lane changes, unequal use of lanes, traffic movements at the multiple driveways on the west side of Eastman Avenue, and fluctuations in driveway movements. These tendencies occur primarily at the intersection of Eastman Avenue and Airport Road and can lower the LOS below the levels shown in the related capacity analysis table (Table 2-3).

The queuing, as well as driver courtesy, along southbound Eastman Avenue back from each signalized intersection dictates whether or not turning movements into and out of the various driveways along the west side of Eastman Avenue are easily accomplished. Any reduction in the average amount of green time along Eastman Avenue severely impacts the queuing, and in turn, the ability for vehicles to turn in and out of the driveways along Eastman Avenue.

Case 3 – Existing 2003 Afternoon Peak Hour Volumes, 4:45-5:45 PM.

During the existing afternoon peak hour, traffic volumes are similar to or higher than the noon peak hour. In parallel to the traffic volumes, the levels of service at each of the intersections are generally longer than during the noon peak hour. All of the intersections continue to operate with a level of service “C” or better, with the exception of Sturgeon Avenue and Airport Road, which was operating at a level of service “D”. In reality, some congestion is often experienced along Eastman Avenue during the afternoon peak hours, which is due to factors including lane changes, unequal use of lanes, traffic movements at the multiple driveways on the west side of Eastman Avenue, and fluctuations in driveway movements. These tendencies occur primarily at the intersection of Eastman Avenue and Airport Road and can lower the LOS below the levels shown in the related capacity analysis table (Table 2-3).

As mentioned previously for the noon peak hour volumes, the queuing along southbound Eastman Avenue back from each signalized intersection can interfere with the turning movements into and out of the various driveways along the west side of Eastman Avenue. Any reduction in the average amount of green time along Eastman Avenue may severely impact the queuing, and in turn the ability for vehicles to turn in and out of the driveways along Eastman Avenue.

Case 4 – Forecast 2023 Morning Peak Hour Volumes – 9:00-10:00 AM

In the 2023 forecast peak hour, with the extra traffic from the assumed background growth (0.5 % per year), the overall congestion and queuing at most of the intersections tends to increase (worsen) somewhat. However, the street system is able to handle the projected traffic volumes without a significant reduction in the level of service at the various intersections.

Case 5 – Forecast 2023 Noon Peak Hour Volumes, 12:00-1:00 PM.

The 2023 forecast noon peak hour results indicate an overall increase in congestion and queuing at most of the intersections in the study area, however the level of service remains within acceptable levels, “C” or better at all of the studied intersections, with the exception of Eastman and Wackerly which was operating at a level of service “D”.

Since the queues along Eastman at Wackerly and at Airport/US-10 Off Ramps will increase somewhat, access into and out of the developments on the western side of Eastman will become more difficult.

Case 6 – Forecast 2023 Afternoon Peak Hour Volumes, 4:45-5:45 PM.

The forecast 2023 afternoon peak hour produced the poorest performance of this entire study, with the highest traffic volumes due to the direct inclusion of traffic from all of the potential developments in the area as well as the 0.5 % per year background growth factor. This worse case scenario insures that improvements recommended for the area can handle the forecast traffic volumes in 2023. Since traffic is dynamic and can vary as stated previously, periodic traffic studies will provide the most accurate traffic volumes and help determine trends and identify when various improvements are actually needed.

In this case, it has been assumed that the Letts Road extension has been constructed and some traffic has been reassigned to use this route to reach the west. The traffic volumes projected to use the Letts Road extension are shown on Figure 2c.

At the intersections of Sturgeon Avenue with Wackerly Street and with Airport Road, the level of service drops to an “F” as too much traffic is passing through these intersections to be accommodated by the existing lanes and traffic control.

The level of service at Jefferson Avenue and Wackerly Street drops to an “E” during this case, with long queues along north and southbound Jefferson Avenue approaching this intersection.

Further north at Jefferson Avenue & Monroe Road, the four-way stop does not adequately handle the projected volumes at this intersection and the corresponding level of service is an “F” with long north and southbound queues.

Along Eastman Avenue, southbound traffic will queue from Airport Road past the southern Mall Exit (which already occurs during the existing conditions on occasion), helping the simulation fail, as traffic can no longer reach Eastman Avenue from the Mall driveway. Turning movements into and out of the driveways on the western side of Eastman Avenue would become very difficult with the increased queuing along Eastman Avenue. Given the projected amount of traffic that may come from US-10 into this area, the queues at the US-10 Off Ramps at Airport

Road begin to back up significantly and likely would back up onto the expressway during this forecast peak hour.

Note: The TSIS program generates a significant amount of results for each of the six cases described above. The technical appendix contains the queue and delay results for each run, however this information is not particularly easy to retrieve. The data has been compiled into easy to read tables that show the turning movement volumes, delay, levels of service, and average queue for each of the major intersections of this study. The TSIS results and the corresponding intersection tables can be found in the technical appendix.

Accident Analysis

The City of Midland has provided non-specific traffic accident data for the Eastman Corridor from January 1, 2001 to October 18th, 2002.

The Table below shows the number of accidents at four of the intersections along Eastman Avenue during this 22-month period.

**Table 16 – Accident Data
Eastman Avenue Corridor**

Intersection	Number of Accidents
Eastman Avenue & Wackerly Street	69
Eastman Avenue & US-10 Ramps	3
Eastman Avenue & Airport Road	107
Eastman Avenue & Monroe Road	4

While the data provided is not broken down into classifications of type, it is apparent that the intersections of Eastman Avenue with Airport Road and Wackerly Street experience accidents at a higher rate probably caused by congestion and higher traffic volumes.

POTENTIAL SOLUTIONS

Eastman Avenue

Due to the congestion experienced along Eastman Avenue during peak shopping times or during Fairground events and considering the projected traffic volumes in the future, a number of options for improvement of Eastman Avenue have been considered. Each is listed in the following paragraphs along with some of the benefits and drawbacks of each option.

Interim Measures

Solutions were considered to alleviate traffic back-ups primarily due to the unequal, or higher use of the outside traffic lane on southbound Eastman Avenue approaching Airport Road. A right turn only lane for traffic traveling southbound on Eastman Avenue when approaching Airport Road would help take some of the traffic out of the southbound queue and more quickly process traffic through the intersection. This right turn lane would begin north of Airport Road and should eventually be carried through to the westbound US-10 On ramp and meet up with the right-turn lane for Eastman Avenue and Wackerly Street. Since there is limited right of way available on the west side of Eastman Avenue for this improvement, this measure would likely require that Eastman Avenue shift one lane to the east between the US-10 ramps and a point

north of Joe Mann Boulevard. In any case, this measure would likely require property acquisition.

However, during the forecast 2023 Afternoon Peak Hour, traffic would queue up from the intersection even with the construction of a right-turn lane for southbound Eastman Avenue at Airport Road. This backup would block traffic coming from the Midland Mall, further contributing to congestion and gridlock. Therefore, the addition of the right turn lane should only be considered as an interim measure.

Long Term Measures

To help move traffic through this area in the future, more drastic changes to the roadway are needed to take traffic away from southbound Eastman Avenue, and to help move traffic off of the US-10 Ramps. Specific Eastman Avenue alternatives are listed below along with benefits and drawbacks of each:

Eastman Avenue, Option A

Create a Boulevard Cross-section from US-10 to north of Joe Mann Boulevard.

Construction of separate north and southbound pavements separated by a narrow boulevard. This would force traffic to turn right onto Eastman Avenue from the streets and driveways at all points of entry. U-turn crossovers would be utilized for traffic to go in the opposite direction. Gaps can be created by traffic signals on only one side of the boulevard rather than on both sides of the boulevard. Better signal progression can be maintained and all signals would operate with only two phases so that traffic can flow through the area more efficiently. Of course, left-turning vehicles will have to go further out of the way (because they would turn right and make a u-turn) to reach their destination, but this is outweighed by the improved efficiency. This option includes a right turn lane for southbound traffic at Airport Road. It also includes a two lane U-turn crossover north of the US-10 off ramp intersection. There will be a need for road widening at each of the U-turn crossovers to accommodate the larger turning radius of truck traffic. The disadvantage of a boulevard is that it requires more right-of-way. The boulevard concept is illustrated on Figure 3.

Eastman Avenue, Option B

Create a Ring Road

One option to consider would be the creation of a ring road for the developments on the western side of Eastman Avenue. With this option, there would be a more unified access to these developments that would take place in a location, such as tying into the southern Midland County Fairgrounds entrance, or a new road across from Joe Mann Boulevard, where southbound queues would not interfere with traffic that wishes to visit these sites. This ring road would also serve to take some traffic off of Eastman Avenue by allowing it to reach Airport Road (or by allowing trips to occur between businesses without use of Eastman Avenue), which may help capacity at the intersection with Airport Road and the US-10 Off Ramps. The ring road could be developed as either a one-way only or for two-way traffic, depending on how traffic is best regulated. This option requires significant additional right-of-way and would be costly. Some business owners may object to not fronting on the main roadway. This option would tend to overload the Eastman Avenue / Airport Road / Off ramp intersection. The ring road concept is illustrated on Figure 4.

Eastman Avenue, Option C

Create A One-Way Pair

An option could be the creation of a one way pair where all of southbound Eastman Avenue traffic would flow through the fairground property and travel behind the developments on the west side of Eastman Avenue and then remerge at the Airport Road intersection. Traffic from the US-10 Off ramp would need to travel north first then either go all the way around the pair, or use a connecting road to reach southbound Eastman Avenue. This option requires significant additional right-of-way, would force traffic to travel significant distances out of their way, and would be costly. Further, many property owners may object to not having direct frontage on the main roadway. This option would tend to overload the Eastman Avenue / Airport Road / Off ramp intersection. The advantage of this option is that movements into and out of the individual properties would be relatively easy to accomplish. This option is illustrated on Figure 5.

Eastman Avenue, Option D

Widening Eastman Avenue to Seven Lanes

This option would add one additional lane to both sides of Eastman Avenue, creating three lanes in each direction plus the center turn lane. The seven lanes would extend from Wackerly Street to north of Joe Mann Boulevard. The TRAF Netsim analysis shows some congestion and backlog at Eastman Avenue and Wackerly Street, however this option provides more capacity through the other intersections along Eastman Avenue. A major disadvantage to the seven lane options is that it would require left turning traffic to traverse an additional 12 feet, making left turn movements into and out of driveways more difficult. Also, the same traffic signal spacing difficulties that exist with the current five lane roadway would still be present. This option is illustrated on Figure 6.

Eastman Avenue, Additional Consideration

Direct Connection from WB US-10 Off-ramp

Although this consideration does not alleviate traffic congestion, significant improvement can be made at the Eastman Avenue / Airport Road / Ramp intersection by removing the traffic that is moving from the ramp to the Midland Mall from the signalized intersection. This can be accomplished via a direct connection from the ramp or by separating one lane of the ramp so that it free flows directly into the Mall's southerly driveway. Of course, this concept would need to have MDOT concurrence. Such a connection would eliminate the potential for ramp traffic backing up onto the freeway. In making this determination, a reasonable estimate of 25% of the westbound US-10 off-ramp traffic turning right onto Eastman Avenue was estimated to utilize the direct connection into the Mall. Two direct connection concepts are shown on Figure 7.

In each of these options, it is important to recognize the need to maximize the green time along Eastman Avenue to help traffic move smoothly. The US-10 Off Ramps will also need to be carefully monitored to ensure that traffic does not back up onto US-10, a very dangerous situation. If queuing on the ramp becomes a problem in the future, it may become necessary to widen the ramp to increase storage.

Recommended Eastman Avenue Option

For a variety of reasons, Options A, the boulevard option, in combination with a direct connection from the westbound US-10 off ramp provides the best solution for Eastman Avenue.

Because traffic signals can be located on one side of the divided roadway, signal progression can be maintained. Because of the prohibition of left turns, the signals can all be two-phase and therefore more efficient. Movements in and out of the driveways and streets along Eastman Avenue can easily be made. The direct connection between the Midland Mall and the westbound US-10 off ramp takes that traffic out of the Airport Road/ US-10 Ramp / Eastman Avenue intersection.

All left turn movements would be made via U-turn crossovers by first turning right out of a driveway or street and then making the U-turn to head in the opposite direction. Similarly, traffic desiring to turn left into driveways or streets would also use U-turn crossovers and then make a right turn into the driveway or street.

A simulation model of this recommended option was made and it functions well as can be noted in Table 17. The TRAF-NETSIM results and corresponding intersection tables can be found in the technical appendix. The recommended Eastman Avenue improvements are shown on Figure 8.

**Table 17 –Capacity Analysis Results
Eastman Avenue Corridor as Boulevard with the Direct Connection
Forecast 2023 Afternoon Peak Hour Volumes**

Intersection	At Wackerly	At SB to NB U-turn North of Wackerly	At Airport & US-10 Ramps
Volume	4497	2133	6471
Delay	36.8	9.4	20.0
LOS	D	A	C
Intersection	At NB to SB U-turn North of Airport	At Mall Exit South	At NB to SB U-turn north of Mall Exit South
Volume	2819	1622	2042
Delay	21.6	10.2	15.4
LOS	C	B	B
Intersection	At Mid Mall Exit	At Joe Mann	At NB to SB U-turn North of Joe Mann
Volume	1782	2538	1976
Delay	13.4	7.1	14.9
LOS	B	A	B

We had assumed that approximately 25% of the traffic that turns right at Eastman Avenue from the westbound US-10 off ramp would use the proposed direct connection to the Midland Mall. [Note: The intersection as a whole would still be able to operate adequately without the direct connection, but when breaking the intersection down into its specific lanes, the westbound US-10 off ramp approach to Eastman Avenue shows a drop from a level of service “D” to an “F” for left turn and through traffic movements. This would have the affect of increasing the average intersection delay from the 20.0 seconds shown in Table 17 to 22.9 seconds (LOS “C”). Specific traffic lane condition results are located in the Capacity Analysis portion of the appendix.]

The capacity analysis results for the boulevard option as well as the exact number, control, and positioning of the various U-turn crossovers along the Eastman Avenue corridor are not intended to be considered as the final plan for the area, but as an example of how the boulevard would operate. There would need to be detailed engineering work and planning to do before the recommended option could be constructed.

Other Locations

For the 2023 forecast afternoon peak hour, other intersections outside of the Eastman Avenue Corridor were also in need of improvement, beyond the improvements that the City is already planning. Those improvements include the following:

- Sturgeon Avenue with Wackerly Street - widen to provide center left-turn lanes, install traffic signal control. Relocate intersection further away from the US-10 bridge if economically feasible.
- Sturgeon Avenue with Airport Road - widen to provide center left-turn lanes, install traffic signal control. Relocate intersection further away from the US-10 bridge if economically feasible. Relocation would likely require the relocation of the Airport Road bridge just west of Sturgeon Avenue.
- Jefferson Avenue and Monroe Road - widen to provide center left-turn lanes, install traffic signal control.
- Joe Mann Boulevard at Wal-Mart/Home Depot Driveway (It is also recommended that a new access point for the Midland Mall be created at this location). It should be noted that this location was chosen for traffic signal control (rather than the nearby Elisenal Drive intersection) because there is a greater separation between Joe Mann Boulevard and the Mall ring road at this point. This will allow more stacking space between Joe Mann and the Mall ring road for a new Mall driveway than is available at the Elisenal location. It is also recommended that right turn lanes be added on Joe Mann Boulevard at the signalized intersection. This new signal will help to create gaps for easier movement in and out of the driveways along Joe Mann Boulevard as well as to allow movement of traffic between the Mall and the businesses located on the north side of Joe Mann.
- Jefferson Avenue & Joe Mann Boulevard – Modify the signal timing to include a separate left-turn phase for north and southbound traffic, or as an alternative investigate a roundabout for this intersection before the land around the intersection can develop. Because this intersection has a wide fluctuation of traffic volumes and traffic patterns both on weekdays and on weekends, and the two predominate movements at this intersection are turning movements (north to west and east to south), this intersection is a logical candidate for a roundabout.
- Jefferson Avenue and Wackerly Street – Add a right-turn only lane for both east and westbound Wackerly Street approaches and modify the signal timing to include a separate left-turn phase for north and southbound traffic.

Understanding when these implementations should occur would require further research and evaluation. Traffic volumes are dynamic or changing through time. Gathering periodic traffic counts in the future will help identify when these improvements will become necessary. The location of these improvements is shown on Figure 9.

Every effort should be taken to provide alternate paths for the public to use, including Letts Road and connections thereto as well as the Stark Road connection with M-20 and the Airport Road extension to Stark Road. The planned Letts Road extension is a very important east/west route providing motorists options in reaching the other north/south thoroughfares.

Recommended Steps Toward Improvement

- Continue with efforts to provide alternate paths for the public to use, including Letts Road extensions and connections thereto as well as the Stark Road connection with M-20 and the Airport Road extension to Stark Road.
- Add a southbound right turn lane for Eastman Avenue at Airport Road and US-10 westbound on-ramp. However, this improvement will provide interim relief, but will not alleviate the anticipated future traffic problems.
- Redesign of the Joe Mann Boulevard intersection with the Wal-Mart/Home Depot driveway should be accomplished, including the new connection into the Midland Mall.
- Reconstruct Eastman Avenue as a boulevard (Option A) from US-10 to a point north of Joe Mann Boulevard. Also, create a direct connection from the westbound US-10 off-ramp to the Mall.

The TSIS software confirms that implementation of Option A along with the direct connection would handle the forecast 2023 traffic volumes. If the City decides to implement the boulevard along Eastman Avenue, the City should begin work on identifying the necessary R.O.W. to acquire and begin the actual design of the boulevard section. The City would also want to gather input from local merchants regarding the number and location of the various U-turn crossovers.

Meanwhile, the City should work with the Michigan Department of Transportation to obtain their concurrence in allowing a direct connection from the westbound US-10 off ramp to the Midland Mall. Discussions should be held with the Midland Mall regarding the direct connection with the ramp as well as the new access to Joe Mann Boulevard.

- The City should continue to periodically collect traffic data in the study area, especially along Jefferson Avenue and Sturgeon Avenue so that the City can identify when improvements (traffic signals, additional lanes, etc.) to those intersections would be needed and implemented.