TRAFFIC IMPACT STUDY

For The Proposed

Park District Development

City of East Lansing, Ingham County, MI

March, 2013

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EXECUTIVE SUMMARY

Traffic Engineering Associates, Inc. (TEA) conducted a traffic impact study for the proposed Park District development in the City of East Lansing, Ingham County, Michigan. The new development will consist of four (4) buildings. Building A will be a 120 room hotel, with 126 apartments, 15,899 square feet of retail, a 7,950 square foot restaurant, a 3,000 square foot bank and 23,387 square feet of office space. Building B will have 121 apartments and an 8,700 square foot restaurant. Building C will have 105 apartments and a 20,190 square foot grocery store. Building D will have 128 apartments.

For this traffic impact study, it was understood that the proposed Park District development could have minor changes in the site plan and small additions or deletions in the proposed uses; therefore, the above project description was based on the most up to date site plans available at the time the traffic impact study was completed.

The proposed development is expected to begin construction in the spring of 2015 and be completed in 2018. It is not anticipated that the project will be constructed in specific phases, as the development is interconnected throughout and operates as a uniform site.

Parking is being provided onsite in both Building A and Building C. Building A will have approximately 70 parking spaces that will be valet parking only with direct access onto Albert Avenue, just west of Abbot Road. Building C will have approximately 800 parking spaces with two (2) entrances; one (1) entrance on Albert Avenue, just west of the valet parking entrance for Building A and one (1) entrance on Abbot Road north of Linden Street across from the City of East Lansing Courthouse parking lot. For this study, traffic was distributed accordingly to these three (3) parking driveways.

The intersections defined for this study were analyzed according to the methodologies published in the most recent edition of the *Highway Capacity Manual.* The analysis determines the "Level of Service" (LOS) of the intersections and is defined by average vehicle delay in seconds created by a traffic control device for a given traffic movement, or intersection approach. Level of Service is expressed in a range from "A" to "F," with "A" being the highest LOS and "F" representing the lowest LOS. Level of service "D" is considered the minimum acceptable LOS in most urban areas.

TEA, Inc. conducted vehicle turning movement surveys during the morning and afternoon peak periods at eleven (11) surrounding intersections in the project area. The existing weekday AM and PM peak hour traffic volumes are 7:30 – 8:30 AM and 4:45 – 5:45 PM. The analysis shows that under existing conditions the studied intersections operate at a good level of service (LOS D or better), with all movements operating at an acceptable level of service (LOS D or better) except for one movement. During the AM peak hour, the southbound thru-left turn movement at the intersection of Abbot Road and Grand River Avenue (M-43) operates at a LOS F with 96.8 seconds of delay.

The Tri-County Regional Planning Commission provided TEA with a background growth rate estimate of one-half percent (0.5%), which was projected out to 2018 to represent background traffic growth without the addition of the Park District development.

One (1) new development was identified in the near vicinity of the Park District development to be included as background development. The proposed The Gateway development will be located between Grand River Avenue (M-43) and Valley Court, and will be located on the east and west side of Delta Street. Trip generation values were obtained from the Traffic Engineering Associates, Inc. (TEA) traffic study dated January, 2014.

Under background conditions, all movements are expected to operate at an acceptable level of service (LOS D or better) except for three (3) movements. During the AM peak hour, the southbound left-thru movement at the intersection of Abbot Road and Grand River Avenue (M-43) is anticipated to operate at a LOS F with 98.5 seconds of delay, a 1.8 second increase from existing conditions. The northbound left turn movement at the intersection of Delta Street and Grand River Avenue (M-43) is anticipated to operate at a LOS E with 46.7 seconds of delay during the PM peak hour, a 22.4 second increase from existing conditions. Also during the PM peak hour, the southbound left turn movement at the intersection of Delta Street and Grand River Avenue (M-43) is anticipated to operate at a LOS E with 39.0 seconds of delay, an 18.0 second increase from existing conditions.

The proposed Park District development trip generation rates were derived from the ITE Trip Generation Manual (9^{th} Edition). Reductions were made to the proposed development traffic volumes in accordance with the City of East Lansing zoning code for this area which allows for a twenty-five percent (25%) reduction of trips for the retail development. It is projected that the proposed Park District development will generate 501 vehicle trips in the AM peak hour, 725 vehicle trips in the PM peak hour, of which 106 are pass-by trips, and 7,280 weekday trips.

Under future conditions, all studied intersections are projected to operate at a good level of service (LOS D or better). It is anticipated that all movements will operate at an acceptable level of service, (LOS D or better), except for the eastbound and westbound movements on Albert Avenue at Abbot Road, as well as the northbound and southbound movements for Delta Street at Grand River Avenue (M-43). There are expected to be lengthy delays at these two intersections during the PM peak hour.

To mitigate these delays, it is recommended that a new eastbound exclusive left turn lane be added at the intersection of Albert Avenue and Abbot Road, in conjunction with the retiming of the traffic signal which will allow for eastbound and westbound head-up left turn lanes. At the intersection of Grand River Avenue (M-43) and Delta Street, a signal warrant analysis was conducted. It was determined that the PM peak hour meets Warrant 3, Peak Hour, for the recommendation of a traffic signal. As such, a new traffic signal at this intersection was provided to offer signalized traffic control for Delta Street.

With these improvements, all studied intersections and movements are expected to operate at a good level of service (LOS D) or better except for the northbound thru movement at the

intersection of Albert Avenue and Abbot Road. During the PM peak hour, this movement is anticipated to operate at a LOS E with 60.9 seconds of delay, a 1.8 second increase from future conditions.

The findings of this study show that a new exclusive eastbound left turn lane should be constructed at the intersection of Albert Avenue and Abbot Road, along with updated traffic signal timing. As shown on the proposed site plan, Albert Avenue should be extended to the west and realigned to connect with Valley Court, with Evergreen Avenue creating a "T" intersection. All driveways should be constructed as two (2) lanes with one (1) inbound and one (1) outbound lane. In addition, a review should be conducted in the future when the Park District is complete to determine if a traffic signal is warranted at the intersection of Grand River Avenue (M-43) and Delta Street.

INTRODUCTION

PROJECT DESCRIPTION

The purpose of this study is to determine the impact of traffic to be generated by the construction of the proposed Park District development in the City of East Lansing, Ingham County, Michigan. The new development will consist of four (4) buildings. Building A will be a 120 room hotel, with 126 apartments, 15,899 square feet of retail, a 7,950 square foot restaurant, a 3,000 square foot bank and 23,387 square feet of office space. Building B will have 121 apartments and an 8,700 square foot restaurant. Building C will have 105 apartments and a 20,190 square foot grocery store. Building D will have 128 apartments.

For this traffic impact study, it was understood that the proposed Park District development could have minor changes in the site plan and small additions or deletions in the proposed uses; therefore, the above project description was based on the most up to date site plans available at the time the traffic impact study was completed.

The proposed development is expected to begin construction in the spring of 2015 and be completed in 2018. It is not anticipated that the project will be constructed in specific phases, as the development is interconnected throughout and operates as a uniform site.

Parking is being provided onsite in both Building A and Building C. Building A will have approximately 70 parking spaces that will be valet only with direct access onto Albert Avenue, just west of Abbot Road. Building C will have approximately 800 parking spaces with two (2) entrances; one (1) entrance on Albert Avenue, just west of the valet parking entrance for Building A and one (1) entrance on Abbot Road north of Linden Street and across from the City of East Lansing Courthouse parking lot. For this study, traffic was distributed accordingly to these three (3) parking driveways.

SCOPE OF WORK

The scope of work contained in this report is as follows:

- Analysis of existing traffic conditions on the adjoining street system, including the following intersections;

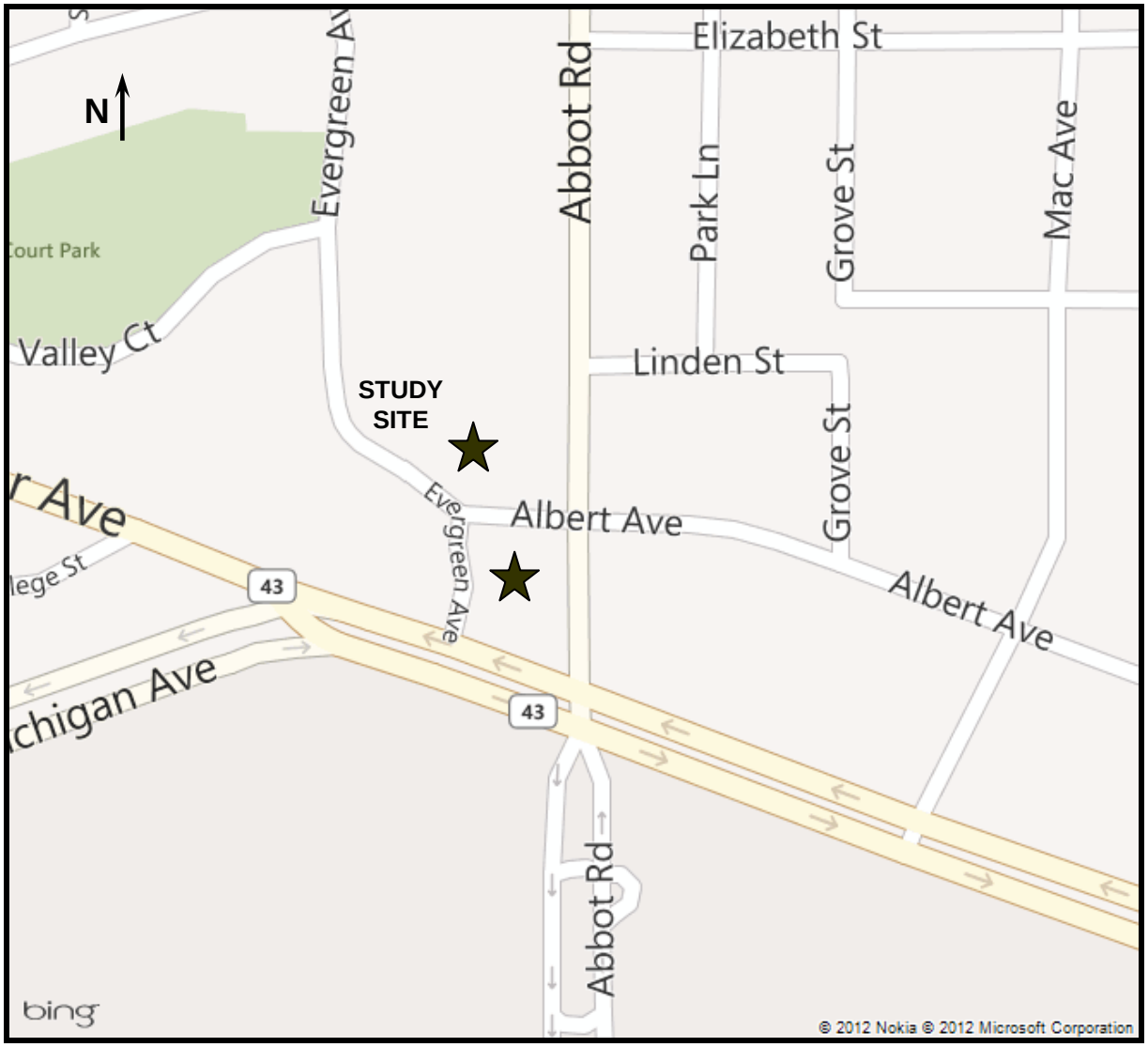
    - Abbot Road and Grand River Avenue (M-43)
    - Abbot Road and Albert Avenue
    - Abbot Road and Oakhill Avenue
    - Grand River Avenue (M-43) and Hillcrest Avenue
    - Grand River Avenue (M-43) and Delta Street
    - Grand River Avenue (M-43) and Michigan Avenue
    - Grand River Avenue (M-43) and MAC Avenue
    - MAC Avenue and Albert Avenue
    - Valley Court and Delta Street
    - Evergreen Avenue and Oakhill Avenue
    - Evergreen Avenue and Albert Avenue

- Analyses of background traffic conditions on the adjoining street system which includes the above listed intersections for the future year 2018 volumes without the proposed Park District development. Also included is the background development, The Gateway, which was identified as being completed prior to completion of the Park District development.

- Projection of future traffic volumes to be generated by the proposed Park District development for the future year.

- Analysis of the impact of future traffic for the proposed Park District development at the above listed intersections.

- Determination of what roadway and traffic control improvements, if any, will be needed to accommodate future traffic volumes for the proposed Park District development.



Study Site Map

Aerial Site Map

EXISTING CONDITIONS

ROADWAYS AND INTERSECTIONS

Roadways

Abbot Road is a north-south, three-lane roadway in the project area with curb and gutter and sidewalk on both sides. The posted speed limit is 25 mph in the project area. The roadway is under the jurisdiction of the City of East Lansing.

Albert Avenue is an east-west, two-lane roadway in the project area with curb and gutter and sidewalk on the south side. The posted speed limit is 25 mph. The roadway is under the jurisdiction of the City of East Lansing.

MAC Avenue is a north-south, two-lane roadway with parking on both sides. MAC is paved with curb and gutter and sidewalk on both sides of the street. The posted speed limit is 25 mph. The roadway is under the jurisdiction of the City of East Lansing.

Evergreen Avenue is a north-south, two-lane roadway in the project area with curb and gutter and sidewalk on both sides. The posted speed limit is 25 mph. The roadway is under the jurisdiction of the City of East Lansing.

Oakhill Avenue is an east-west, two-lane roadway in the project area with curb and gutter and sidewalk on both sides. The posted speed limit is 25 mph. The roadway is under the jurisdiction of the City of East Lansing.

Hillcrest Avenue is a two-lane, north-south roadway, with concrete curb and gutter and sidewalks on both sides. The posted speed limit is 25 MPH. The roadway is under the jurisdiction of the City of East Lansing.

Delta Street is a two-lane, north-south roadway, with concrete curb and gutter and sidewalks on both sides south of Grand River Avenue (M-43). North of Grand River Avenue (M-43), there is bike lanes on both sides of the street with a sidewalk on the east side. The posted speed limit is 25 MPH. The roadway is under the jurisdiction of the City of East Lansing.

Grand River Avenue (M-43) is a seven-lane boulevard roadway in the project area with curb and gutter and sidewalk on both sides. The posted speed limit is 25 mph. The roadway is under the jurisdiction of the Michigan Department of Transportation (MDOT).

Intersections

The intersection of Abbot Road and Albert Avenue is controlled by a traffic signal. The north approach on Abbot Road has three (3) lanes; one (1) exclusive left turn lane, one (1) thru-right turn lane and one (1) outbound lane. The south approach also has three (3) lanes; one (1) exclusive right turn lane, one (1) thru lane and one (1) outbound lane, there is a NO LEFT TURN restriction for northbound traffic. The west approach on Albert Avenue is a two (2) lane approach with one (1) left-thru-right lane and one (1) outbound lane. The east approach on Albert Avenue has three (3) lanes; one (1) exclusive left turn lane, one (1) thru-right turn lane and one (1) outbound lane. There are marked pedestrian crosswalks at all four

(4) approaches with pedestrian crossing signals. Only the northbound approach is marked as "No Turn On Red".

The intersection of Abbot Road and Grand River Avenue (M-43) is controlled by a traffic signal. The north approach on Abbot Road has four (4) lanes; one (1) exclusive right turn lane, one (1) thru-left turn lane and two (2) outbound lanes. The south approach on Abbot Road (MSU entrance) has two (2) lanes; one (1) thru-right lane with one (1) outbound lane with and a seventy (70) foot wide boulevard separating the inbound and outbound lanes. The east approach on Grand River Avenue (M-43) has six (6) lanes; one (1) thru-right lane, two (2) thru lanes and three (3) outbound lanes. The west approach on Grand River Avenue (M-43) has seven (7) lanes; one (1) exclusive left turn lane, two (2) thru lanes, one (1) exclusive right turn lane and three (3) outbound lanes. There is a thirty-two (32) foot grass median separating the eastbound and westbound traffic. There are marked pedestrian crosswalks at all approaches with pedestrian crossing signals except for the west approach which is restricted and has no crosswalk. The northbound approach on Abbot Road leaving the MSU campus, and the westbound approach on Grand River Avenue (M-43) are both signed for "No Left Turn". The eastbound, westbound and northbound approaches are signed for "No Turn On Red." The southbound Abbot Road approach is signed as "No Turn On Red When Pedestrians Present".

The intersection of Albert Avenue and Evergreen Avenue is a "T" intersection where westbound Albert Avenue stops for northbound and southbound Evergreen Avenue. The north approach on Evergreen has two (2) lanes; one (1) thru-left turn lane and one (1) outbound lane. The south approach on Evergreen Avenue has two (2) lanes; one (1) thru-right lane and one (1) outbound lane. The east approach on Albert Avenue has two (2) lanes; one (1) left-right turn lane and one (1) outbound lane.

The intersection of Oakhill Avenue and Evergreen Avenue is a four-way intersection where northbound and southbound Evergreen Avenue stops for eastbound and westbound Oakhill Avenue. The north and south approaches on Evergreen Avenue have two (2) lanes; one (1) left-thru-right lane and one (1) outbound lane. The east and west approaches on Oakhill Avenue have two (2) lanes; one (1) left-thru-right lane and one (1) outbound lane.

The intersection of Oakhill Avenue and Abbot Road is a "T" intersection where eastbound Oakhill Avenue stops for northbound and southbound Abbot Road. The north approach on Abbot Road has three (3) lanes; one (1) thru-right turn lane, one (1) two-way left turn lane, and one (1) outbound lane. The south approach on Abbot Road has three (3) lanes; one (1) exclusive center left turn lane, one (1) thru lane and one (1) outbound lane. The west approach on Oakhill Avenue has two (2) lanes; one (1) left-right turn lane and one (1) outbound lane.

The intersection of MAC Avenue and Grand River Avenue (M-43) is a "T" intersection and is controlled by a traffic signal. The north approach on MAC Avenue has three (3) lanes; two (2) exclusive right turn lanes and one (1) outbound lane. The east approach on Grand River Avenue (M-43) has five (5) lanes; one (1) thru-right lane, two (2) thru lanes and two (2) outbound lanes. The west approach on Grand River Avenue (M-43) has six (6) lanes; one

(1) exclusive left turn lane, two (2) thru lanes and three (3) outbound lanes. There is a thirty-two (32) foot grass median separating the eastbound and westbound traffic. There are marked pedestrian crosswalks at the east and north approach with pedestrian crossing signals. The westbound and southbound approaches are signed for "No Turn On Red."

The intersection of Michigan Avenue and Grand River Avenue (M-43) is a "T" intersection and is controlled by a traffic signal. The south approach on Michigan Avenue has four (4) lanes; two (2) exclusive right turn lanes and two (2) outbound lanes. The west approach on Grand River Avenue (M-43) has four (4) lanes with two (2) thru lanes and two (2) outbound lanes. The east approach on Grand River Avenue (M-43) has five (5) lanes; one (1) exclusive left turn lane, one (1) thru-left turn lane, one (1) thru lane and two (2) outbound lanes. There is a thirty-two (35) foot grass median separating the northbound and southbound traffic on Michigan Avenue. There are marked pedestrian crosswalks at the west and south approaches with pedestrian crossing signals.

The intersection of MAC Avenue and Albert Avenue is controlled by a traffic signal. The north and south approaches on MAC Avenue have three (3) lanes; one (1) exclusive left turn lane, one (1) thru-right lane and one (1) outbound lane. The east and west approaches on Albert Avenue have three (3) lanes; one (1) exclusive left turn lane, one (1) thru-right lane and one (1) outbound lane. There are marked pedestrian crosswalks on all approaches.

The intersection of Grand River Avenue (M-43) and Hillcrest Avenue is controlled by a traffic signal. The east and west approaches on Grand River Avenue (M-43) are three (3) lanes with one (1) exclusive left turn lane, one (1) thru-right turn lane and one (1) outbound lane. The north and south approaches on Hillcrest Avenue are two (2) lanes with one (1) left-thru-right turn lane and one (1) outbound lane.

The intersection of Grand River Avenue (M-43) and Delta Street is controlled by a stop sign for northbound and southbound Delta Street. The east and west approaches on Grand River Avenue (M-43) are three (3) lanes with one (1) exclusive left turn lane, one (1) thru-right turn lane and one (1) outbound lane. The north and south approaches on Delta Street are three (3) lanes with one (1) exclusive left turn lane, one (1) thru-right lane and one (1) outbound lane.

The intersection of Valley Court and Delta Street is a "T" intersection and is controlled by a yield sign for northbound Delta Street. The east approach on Valley Court has two (2) lanes; one (1) thru-left turn lane and one (1) outbound lane. The west approach on Valley Court has two (2) lanes with one (1) thru-right turn lane and one (1) outbound lane. The south approach on Delta Street is three (3) lanes with one (1) exclusive left turn lane, one (1) excusive right turn lane and one (1) outbound lane.

LAND USE

The proposed Park District development will consist of four (4) new buildings. The majority of existing uses along the Grand River Avenue (M-43) corridor and in downtown East Lansing are commercial/retail in nature, which includes service providers, restaurants, entertainment and various other uses. Northwest of the intersection of Abbot Road and Albert Avenue is a residential area, and includes City of East Lansing parking lots. The one non-commercial/retail building is People's Church which is located on Grand River Avenue (M-43) west of Abbot Road and adjacent to the proposed Park District project. The south side of Grand River Avenue (M-43) is the Michigan State University (MSU) campus.

EXISTING TRAFFIC VOLUMES

TEA, Inc. used existing vehicle turning movement surveys which included traffic counts during the morning and afternoon peak periods in September, 2012, after the MSU students were back in school at the following locations:

- Abbot Road and Albert Avenue
- Abbot Road and Grand River Avenue (M-43)

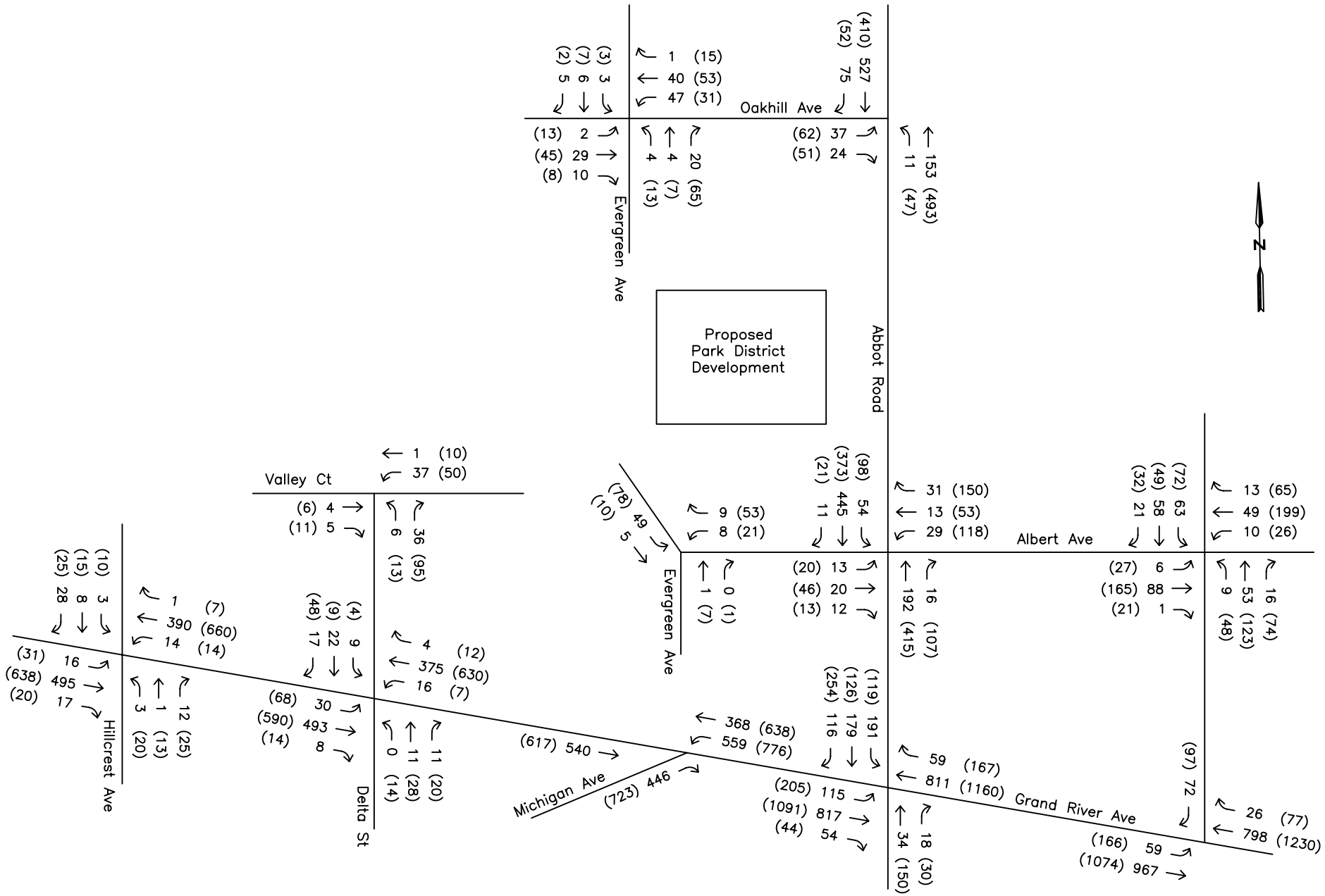
TEA, Inc. used existing vehicle turning movement surveys which included traffic counts during the morning and afternoon peak periods in October, 2012, at the following locations:

- Grand River Avenue (M-43) and Hillcrest Avenue
- Grand River Avenue (M-43) and Delta Street
- Valley Court and Delta Street

TEA, Inc. conducted new vehicle turning movement surveys during the morning and afternoon peak periods in February, 2014, at the following locations;

- Grand River Avenue (M-43) and Michigan Avenue
- Grand River Avenue (M-43) and MAC Avenue
- MAC Avenue and Albert Avenue
- Albert Avenue and Evergreen Avenue
- Evergreen Avenue and Oakhill Avenue
- Oakhill Avenue and Abbot Road

The existing weekday AM and PM peak hour traffic volumes are 7:30 – 8:30 AM and 4:45 – 5:45 PM at the key locations, respectively. The existing volumes are illustrated in **Figure 1**.



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LEGEND

XXX AM Pk Hr (7:30–8:30 AM) Volumes

(XXX) PM Pk Hr (4:45–5:45 PM) Volumes

FIGURE 1: Existing Traffic – Peak Hours

DATE: March, 2014 | SCALE: NTS |

LEVEL OF SERVICE ANALYSIS FOR EXISTING TRAFFIC

The critical intersections defined for this study were analyzed according to the methodologies published in the most recent edition of the *Highway Capacity Manual*. The analysis determines the "Level of Service" of the intersections and is based on factors such as the number and types of lanes, signal timing, traffic volumes, pedestrian activity, etc. The level of service (LOS) is defined by average vehicle delay in seconds created by a traffic control device for a given traffic movement or intersection approach.

Level of Service	Delay per Vehicle (seconds)	
	Non-Signalized	Signalized
A	< 10	<10
B	10 to 15	10 to 20
C	15 to 25	20 to 35
D	25 to 35	35 to 55
E	35 to 50	55 to 80
F	> 50	> 80

Levels of Service are expressed in a range from "A" to "F," with "A" being the highest LOS and "F" representing the lowest LOS. Level of service "D" is considered the minimum acceptable LOS in an urban area.

The above table shows the thresholds for Levels of Service "A" through "F" for non-signalized and signalized intersections, respectively.

All Level of Service computations contained in this report were based upon the Synchro 8 software package which is approved by the Michigan Department of Transportation (MDOT). Delay per vehicle includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay.

The Level of Service analysis for existing traffic at the subject intersections during the peak hours is summarized in **Table 1.**

All existing turning movements at the studied intersections operate at an acceptable level of service (LOS D or better); except for the southbound thru-left turn movement at the intersection of Abbot Road and Grand River Avenue. During the AM peak hour this movement operates at a LOS F with 96.8 seconds of delay.

Table 1
Level of Service (LOS) Summary
Existing Traffic

Location	Movement	Weekday AM Peak Hour		Weekday PM Peak Hour	
		Avg. Delay	LOS	Avg. Delay	LOS
Grand River Avenue (M-43) and Hillcrest Avenue	EB Left	2.6	A	3.3	A
	EB Thru-Right	3.6	A	5.2	A
	WB Left	1.3	A	0.9	A
	WB Thru-Right	1.3	A	1.6	A
	NB Left-Thru-Right	20.8	C	26.3	C
	SB Left-Thru-Right	19.8	B	25.1	C
	Intersection	3.7	A	5.3	A
Grand River Avenue (M-43) and Michigan Avenue	EB Thru	16.9	B	15.2	B
	NB Thru	21.4	C	24.0	C
	SB Thru	8.5	A	24.1	C
	Intersection	12.6	B	20.1	C
Grand River Avenue (M-43) and Abbot Road	EB Left	31.2	C	42.8	D
	EB Thru	8.9	A	11.4	B
	EB Right	5.6	A	6.7	A
	WB Thru-Right	31.0	C	35.9	D
	NB Thru-Right	20.4	C	25.0	D
	SB Thru-Left	96.8	F	28.3	C
	SB Right	9.3	A	12.4	B
	Intersection	43.7	D	26.1	C
Grand River Avenue (M-43) and MAC Avenue	EB Left	15.4	B	18.2	B
	EB Thru	10.5	B	8.3	A
	WB Thru-Right	9.0	A	10.1	B
	SB Right	22.9	C	23.4	C
	Intersection	10.5	B	12.6	B

Note: Delay = Average control delay per vehicle in seconds.
LOS = Level of Service

Table 1 (Continued)
Level of Service (LOS) Summary
Existing Traffic

Location	Movement	Weekday AM Peak Hour		Weekday PM Peak Hour	
		Avg. Delay	LOS	Avg. Delay	LOS
Abbot Road and Albert Avenue	EB Left-Thru-Right	27.6	C	33.5	C
	WB Left	34.9	C	45.2	D
	WB Thru-Right	16.6	B	21.4	C
	NB Thru	15.2	B	15.0	C
	NB Right	10.1	B	11.1	B
	SB Left	5.3	A	6.2	A
	SB Thru-Right	7.5	A	6.0	A
	Intersection	11.6	B	18.8	B
Albert Avenue and MAC Avenue	EB Left	9.8	A	10.6	B
	EB Thru-Right	10.8	B	11.1	B
	WB Left	10.0	A	10.4	B
	WB Thru-Right	9.0	A	11.8	B
	NB Left	10.6	B	11.4	B
	NB Thru-Right	9.2	A	9.7	A
	SB Left	12.2	B	12.2	B
	SB Thru-Right	9.1	A	7.8	A
	Intersection	10.1	B	10.8	B
Grand River Avenue (M-43) and Delta Street	EB Left	8.2	A	9.4	A
	EB Thru-Right	0.0	A	0.0	A
	WB Left	9.0	A	9.0	A
	WB Thru-Right	0.0	A	0.0	A
	NB Left	0.0	A	24.3	C
	NB Thru-Right	14.3	B	18.6	C
	SB Left	16.2	C	21.0	C
	SB Thru-Right	13.9	B	16.0	C

Note: Delay = Average control delay per vehicle in seconds.
LOS = Level of Service

Table 1 (Continued)
Level of Service (LOS) Summary
Existing Traffic

Location	Movement	Weekday AM Peak Hour		Weekday PM Peak Hour	
		Avg. Delay	LOS	Avg. Delay	LOS
Delta Street and Valley Court	EB Thru-Right	0.0	A	0.0	A
	WB Left-Thru	7.1	A	6.2	A
	NB Left	9.2	A	9.7	A
	NB Right	8.6	A	8.7	A
Albert Avenue and Evergreen Avenue	WB Left- Right	8.9	A	9.2	A
	NB Thru-Right	0.0	A	0.0	A
	SB Left-Thru	6.6	A	6.6	A
Abbot Road and Oakhill Avenue	EB Left-Right	14.7	B	16.2	C
	NB Left	9.3	A	8.7	A
	NB Thru	0.0	A	0.0	A
	SB Thru-Right	0.0	A	0.0	A
Oakhill Avenue and Evergreen Avenue	EB Left-Thru-Right	0.4	A	1.5	A
	WB Left-Thru-Right	4.1	A	2.5	A
	NB Left-Thru-Right	9.3	A	9.6	A
	SB Left-Thru-Right	10.1	B	11.0	B

Note: Delay = Average control delay per vehicle in seconds.
LOS = Level of Service

BACKGROUND CONDITIONS

BACKGROUND TRAFFIC VOLUMES – GROWTH RELATED

Background traffic represents future volumes without the traffic generated by the proposed Park District development. The target year for completion is 2018; therefore, a four (4) year growth rate was applied to the existing traffic volumes.

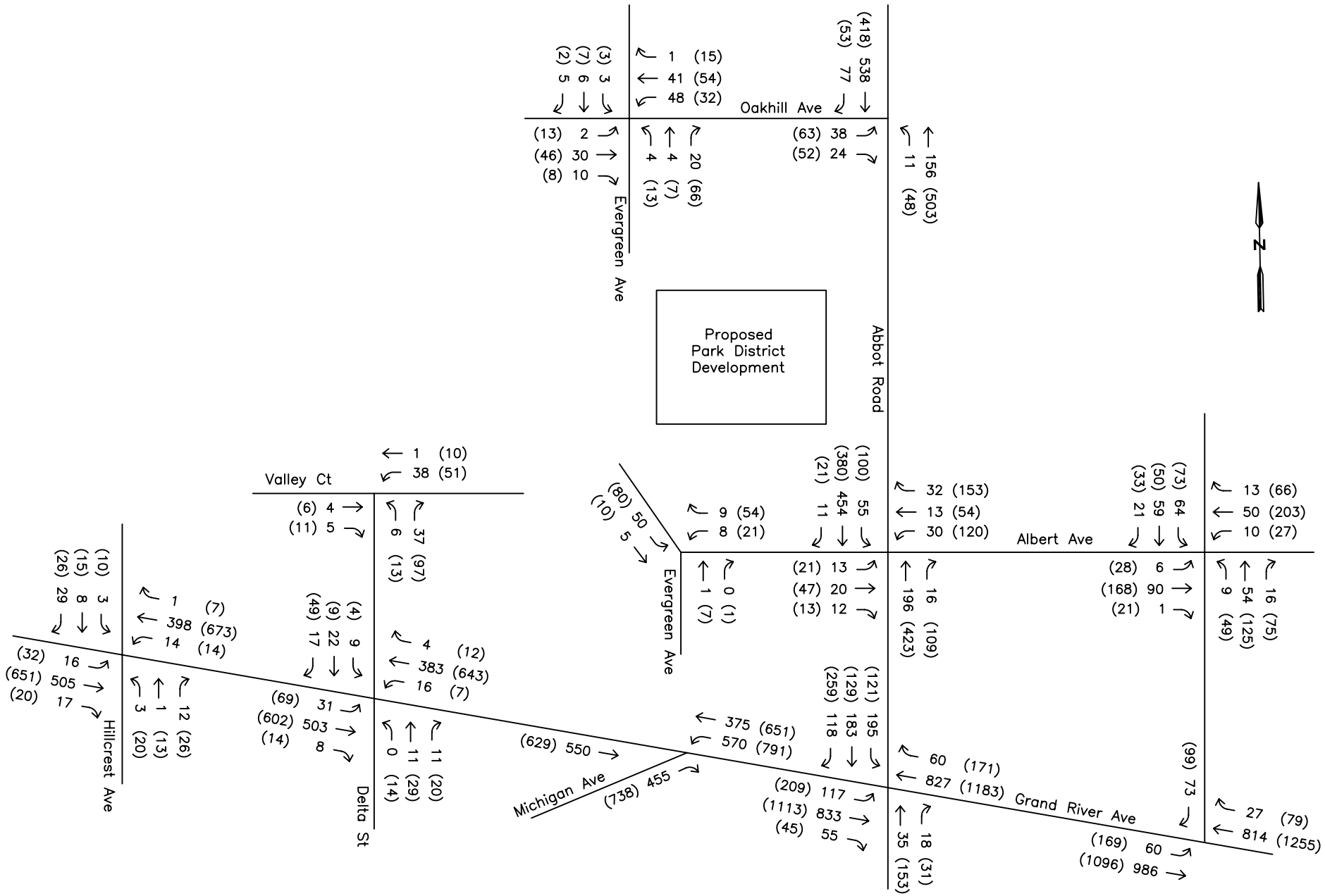
Population growth is the driving force behind area-wide traffic growth. According to the most recent data from the US Census Bureau, from 2000-2010, Ingham County had an exponential growth rate of zero point zero six percent (0.06%) per year, and the City of East Lansing had a growth of zero point four three percent (0.43%) per year. Information provided to TEA from the Tri-County Regional Planning Commission estimates an approximate zero point five percent (0.5%) growth rate for the project area. As such, a one-half percent growth rate was applied exponentially for a three year time period to represent population growth for the City of East Lansing. The proposed growth related background weekday AM and PM peak hour traffic volumes are illustrated in **Figure 2A.**

BACKGROUND TRAFFIC VOLUMES – DEVELOPMENT RELATED

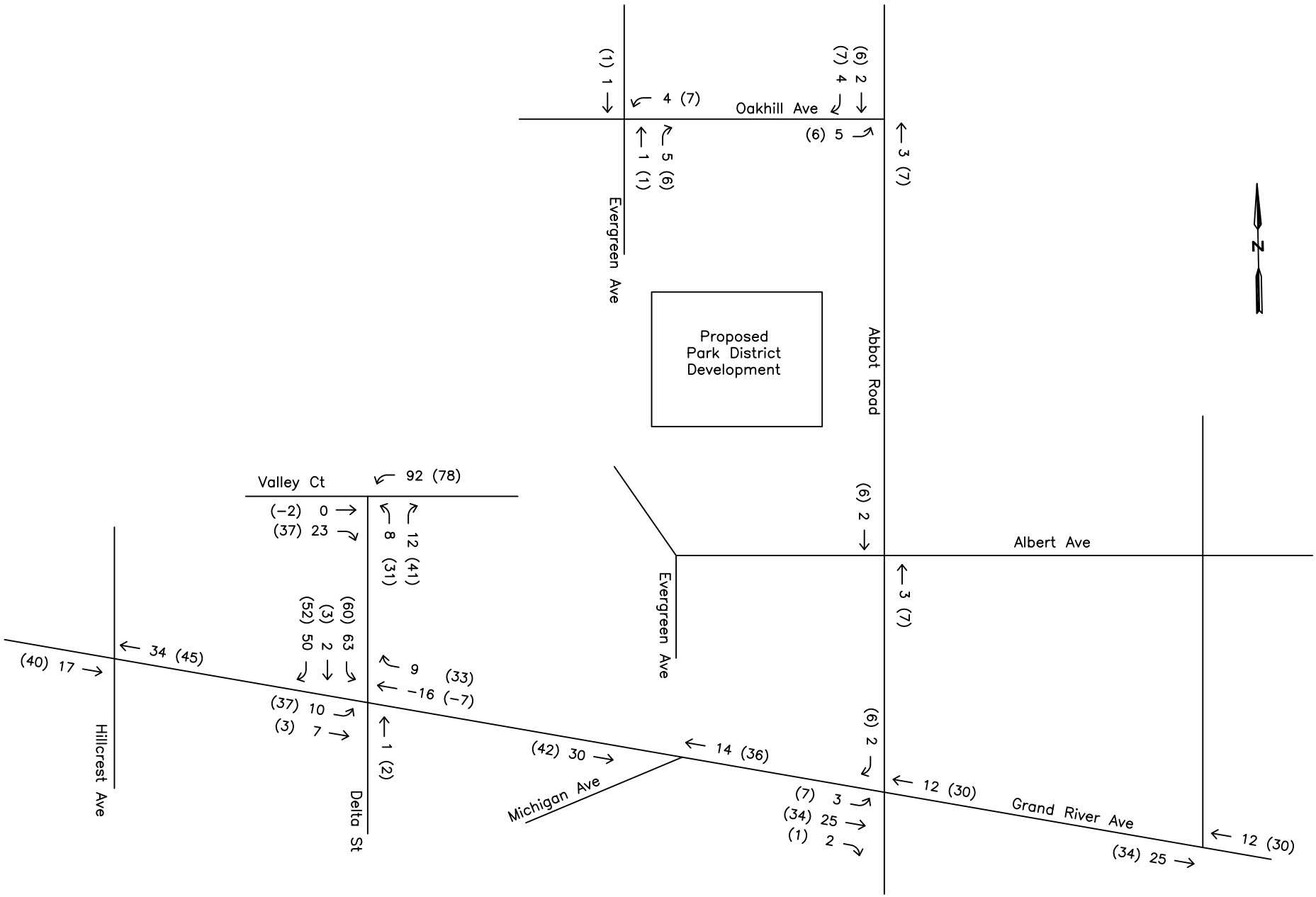
One (1) new development was identified in the near vicinity of the Park District development to be included as background development. The proposed The Gateway development will be located between Grand River Avenue (M-43) and Valley Court, and will also be located on the east and west side of Delta Street. The proposed site will contain a six (6) story building in which the ground floor will consist of parking, a 2,625 square foot Biggby coffee shop with a patio and drive through lane, a 2,202 square foot fitness center for apartment residents, and a 725 square foot leasing office. The second level will contain a parking ramp situated on both sides of Delta Street with the proposed building bridging over the roadway. The third through sixth floors will contain 168 residential apartment units. There will also be a below grade parking facility on the west side of Delta Street. Trip generation values were obtained from the Traffic Engineering Associates, Inc. (TEA) traffic study dated January, 2014.

The proposed development background weekday AM and PM peak hour traffic volumes are illustrated in **Figure 2B.**

Adding the future traffic volumes from the proposed The Gateway development (Figure 2B), to the background growth related traffic volumes (Figure 2A) will represent the total background traffic. The total AM and PM peak hour background traffic is shown in **Figure 2C**.



TRAFFIC ENGINEERING ASSOCIATES, INC. PO Box 100 Saranac, MI 48881 PHONE: (517) 627-6028	LEGEND XXX AM Pk Hr (7:30–8:30 AM) Volumes (XXX) PM Pk Hr (4:45–5:45 PM) Volumes	FIGURE 2A: Background Growth Traffic – Peak Hours	
		DATE: March, 2014	SCALE: NTS	PAGE: 19



TRAFFIC ENGINEERING ASSOCIATES, INC. PO Box 100 Saranac, MI 48881 PHONE: (517) 627-6028	LEGEND XXX AM Pk Hr (7:30-8:30 AM) Volumes (XXX) PM Pk Hr (4:45-5:45 PM) Volumes	FIGURE 2B: Background Development Traffic – Peak Hours	
		DATE: March, 2014	SCALE: NTS	PAGE: 20

FIGURE 2C: Total Background Traffic – Peak Hours

DATE: March, 2014 | SCALE: NTS | PAGE: 21

LEGEND

XXX AM Pk Hr (7:30–8:30 AM) Volumes

(XXX) PM Pk Hr (4:45–5:45 PM) Volumes

TRAFFIC ENGINEERING ASSOCIATES, INC.
PO Box 100
Saranac, MI 48881
PHONE: (517) 627-6028

LEVEL OF SERVICE ANALYSIS FOR BACKGROUND TRAFFIC

The level of service analysis for background 2018 traffic is summarized in **Table 2**. All existing roadway geometrics and traffic control devices were utilized for the background analysis except for Delta Street between Grand River Avenue and Valley Court. This portion of Delta Street was modeled as shown in future recommended conditions for The Gateway development with an extended southbound center left turn lane from Grand River Avenue to Valley Court.

Under background conditions, all studied intersections overall are expected to operate at a good level of service (LOS D or better). All movements are expected to operate at an acceptable level of service (LOS D or better) except the following movements;

- Northbound left turn movement at the intersection of Delta Street and Grand River Avenue (M-43). During the PM peak hour, this movement is anticipated to operate at a LOS E with 46.7 seconds of delay, a 22.4 second increase from existing conditions.

- Southbound left turn movement at the intersection of Delta Street and Grand River Avenue (M-43). During the PM peak hour, this movement is anticipated to operate at a LOS E with 39.0 seconds of delay, an 18.0 second increase from existing conditions.

- Southbound left-thru movement at the intersection of Abbot Road and Grand River Avenue (M-43). During the AM peak hour, this movement is anticipated to operate at a LOS F with 98.5 seconds of delay, a 1.8 second increase from existing conditions.

Table 2
Level of Service (LOS) Summary
Background Traffic

Location	Movement	Weekday AM Peak Hour		Weekday PM Peak Hour	
		Avg. Delay	LOS	Avg. Delay	LOS
Grand River Avenue (M-43) and Hillcrest Avenue	EB Left	2.7	A	3.4	A
	EB Thru-Right	4.5	A	5.6	A
	WB Left	1.5	A	1.1	A
	WB Thru-Right	1.8	A	2.1	A
	NB Left-Thru-Right	20.7	C	26.1	C
	SB Left-Thru-Right	19.5	B	24.6	C
	Intersection	4.2	A	5.6	A
Grand River Avenue (M-43) and Michigan Avenue	EB Thru	17.4	B	16.1	B
	NB Thru	21.6	C	24.3	C
	SB Thru	8.8	A	24.8	C
	Intersection	13.3	B	20.7	C
Grand River Avenue (M-43) and Abbot Road	EB Left	31.6	C	45.5	D
	EB Thru	9.1	A	12.2	B
	EB Right	5.4	A	6.6	A
	WB Thru-Right	31.4	C	38.7	D
	NB Thru-Right	20.4	C	25.2	C
	SB Thru-Left	98.5	F	28.7	C
	SB Right	9.3	A	12.7	B
	Intersection	44.1	D	27.8	C
Grand River Avenue (M-43) and MAC Avenue	EB Left	15.5	B	17.9	B
	EB Thru	10.8	B	8.6	A
	WB Thru-Right	9.1	A	10.4	B
	SB Right	22.9	C	23.4	C
	Intersection	11.1	B	12.8	B

Note: Delay = Average control delay per vehicle in seconds.
LOS = Level of Service

Table 2 (Continued)
Level of Service (LOS) Summary
Background Traffic

Location	Movement	Weekday AM Peak Hour		Weekday PM Peak Hour	
		Avg. Delay	LOS	Avg. Delay	LOS
Abbot Road and Albert Avenue	EB Left-Thru-Right	27.6	C	34.0	C
	WB Left	35.0	C	45.8	D
	WB Thru-Right	16.4	B	21.9	C
	NB Thru	15.6	B	36.7	D
	NB Right	10.1	B	11.1	B
	SB Left	5.3	A	6.5	A
	SB Thru-Right	7.6	A	6.1	A
	Intersection	11.8	B	23.2	C
Albert Avenue and MAC Avenue	EB Left	9.8	A	10.7	B
	EB Thru-Right	10.8	B	11.2	B
	WB Left	10.0	A	10.4	B
	WB Thru-Right	9.0	A	12.0	B
	NB Left	10.6	B	11.4	B
	NB Thru-Right	9.2	A	9.8	A
	SB Left	12.3	B	12.3	B
	SB Thru-Right	9.1	A	7.8	A
	Intersection	10.1	B	10.9	B
Grand River Avenue (M-43) and Delta Street	EB Left	8.3	A	9.9	A
	EB Thru-Right	0.0	A	0.0	A
	WB Left	9.0	A	9.1	A
	WB Thru-Right	0.0	A	0.0	A
	NB Left	0.0	A	46.7	E
	NB Thru-Right	14.9	B	22.4	C
	SB Left	21.0	C	39.0	E
	SB Thru-Right	13.5	B	20.0	C

Note: Delay = Average control delay per vehicle in seconds.
LOS = Level of Service

Table 2 (Continued)
Level of Service (LOS) Summary
Background Traffic

Location	Movement	Weekday AM Peak Hour		Weekday PM Peak Hour	
		Avg. Delay	LOS	Avg. Delay	LOS
Delta Street and Valley Court	EB Thru-Right WB Left-Thru NB Left-Right	0.0 7.5 9.5	A A A	0.0 7.2 10.6	A A B
Albert Avenue and Evergreen Avenue	WB Left- Right NB Thru-Right SB Left-Thru	8.9 0.0 6.7	A A A	9.2 0.0 6.6	A A A
Abbot Road and Oakhill Avenue	EB Left-Right NB Left NB Thru SB Thru-Right	15.2 9.3 0.0 0.0	C A A A	17.1 8.8 0.0 0.0	C A A A
Oakhill Avenue and Evergreen Avenue	EB Left-Thru-Right WB Left-Thru-Right NB Left-Thru-Right SB Left-Thru-Right	0.4 4.3 9.3 10.3	A A A B	1.5 2.9 9.7 11.3	A A A B

Note: Delay = Average control delay per vehicle in seconds.
LOS = Level of Service

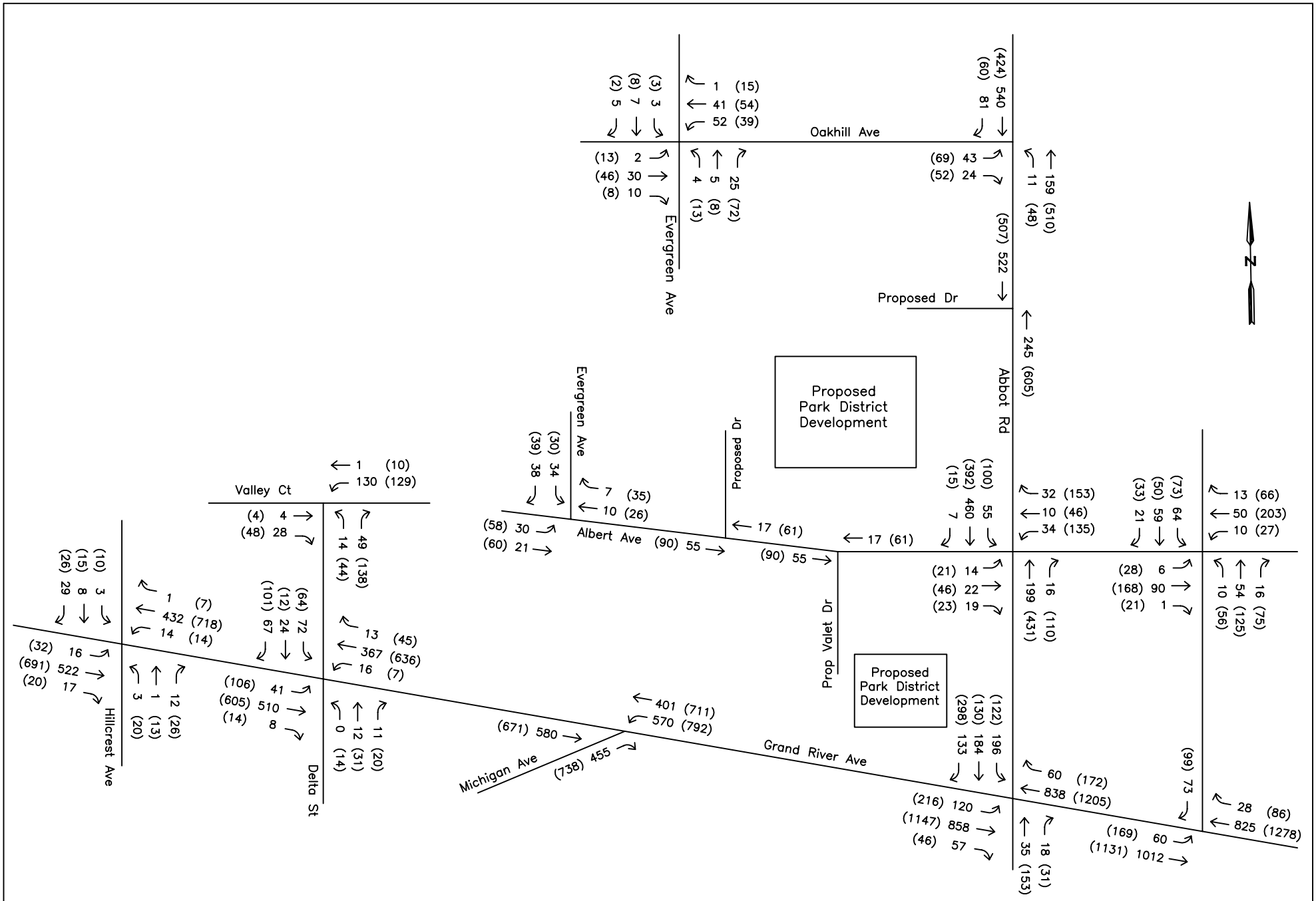
FUTURE CONDITIONS

FUTURE DISTRIBUTION OF BACKGROUND TRAFFIC

As part of the proposed Park District development, there will be a change in the existing public roadways. Evergreen Avenue is a north-south roadway and extends from Grand River Avenue (M-43) at the south end, to the Hannah Building at the north end. Both Valley Court and Albert Avenue "T" into Evergreen Avenue.

As part of the Park District development, the proposed roadway changes includes extending the west leg of Albert Avenue from Abbot Road to the west and aligning with Valley Court to create a continuous east-west Albert Avenue. Evergreen Avenue will then "T" into the extended Albert Avenue, and the south portion of Evergreen Avenue between Albert Avenue and Grand River Avenue (M-43) will be eliminated.

With these roadway geometric changes, the background traffic volumes were adjusted to the new roadway layout in order to determine future traffic impacts. The redistributed background traffic volumes are illustrated in **Figure 3**.



TRAFFIC ENGINEERING ASSOCIATES, INC. PO Box 100 Saranac, MI 48881 PHONE: (517) 627-6028	LEGEND XXX AM Pk Hr (7:30–8:30 AM) Volumes (XXX) PM Pk Hr (4:45–5:45 PM) Volumes	FIGURE 3: Redistributed Background Traffic – Peak Hours	
		DATE: March, 2014	SCALE: NTS	PAGE: 28

SITE TRAFFIC GENERATION

The trip generation rates for the proposed Park District development were derived from the ITE TRIP GENERATION MANUAL (9th edition).

The ITE trip generation rates for Hotel (Land Use Code 310) were chosen to represent the proposed 120 unit hotel. The ITE Trip Generation Manual description for Hotel includes a restaurant, and the proposed new hotel in the Park District development will include a 7,950 square foot restaurant; therefore, a separate trip generation was not generated for the proposed new restaurant as it was estimated that the trip generation for the hotel would include trips generated by the attached restaurant. The ITE description of Hotel is as follows:

Hotels are places of lodging that provide sleeping accommodations and supporting facilities such as restaurants, cocktail lounges, meeting and banquet rooms or convention facilities, limited recreational facilities (pool, fitness room) and/or other retail service shops. Some of the sites included in this land use category are actually large motels providing the hotel facilities noted above.

The ITE trip generation rates for Apartments (Land Use Code 220) were selected to represent the proposed 480 apartment units. The ITE description of Apartments is as follows:

Apartments are rental dwelling units located within the same building with at least three other dwelling units, for example, quadraplexes and all types of apartment buildings. The studies included in this land use did not identify whether the apartments were low-rise, mid-rise, or high-rise.

The ITE trip generation rates for Walk-in Bank (Land Use Code 911) were chosen to represent the proposed 3,000 square foot bank. The ITE description of Walk-In Bank is as follows:

Walk-in banks are generally free-standing buildings with their own parking lots. These banks do not have drive-in lanes but usually contain non-drive-through automatic teller machines (ATM's).

The ITE Trip Generation Manual does not provide trip generation estimates for the AM peak hour for this land use.

The ITE trip generation rates for Single Tenant Office Building (Land Use Code 715) were selected to represent the 23,387 square foot office space. The ITE description for Single Tenant Office Building is as follows:

A single tenant office building generally contains offices, meeting rooms and space for file storage and data processing of a single business or company and possibly other service functions including a restaurant or cafeteria.

The ITE trip generation rates for Specialty Retail (Land Use Code 826) were chosen to best represent the 15,899 square foot retail space. The ITE description for Specialty Retail is as follows:

Specialty Retail centers are generally small strip shopping centers that contain a variety of retail shops and specialize in quality apparel, hard goods and services, such as real estate offices, dance studios, florists and small restaurants.

The ITE Trip Generation Manual does not provide trip generation estimates for the AM peak hour for this land use.

The ITE trip generation rates for High-Turnover (Sit-Down) Restaurant (Land Use Code 932) were selected to represent the 8,700 square foot restaurant. The ITE description for High-Turnover (Sit-Down) Restaurant is as follows:

This land use consists of sit-down, full-service eating establishments with typical duration of stay of approximately one hour. This type of restaurant is usually moderately priced and frequently belongs to a chain. Generally, these restaurants serve lunch and dinner; they may also be open for breakfast and are sometimes open 24 hours per day. These restaurants typically do not take reservations. Patrons commonly wait to be seated, are served by a waiter/waitress, order from menus and pay for their meal after they eat. Some facilities contained within this land use may also contain a bar area for serving food and alcoholic drinks.

The ITE trip generation rates for Supermarket (Land Use Code 850) were selected to represent the 20,190 square foot grocery store. The ITE description for Supermarket is as follows:

Supermarkets are free-standing retail stores selling a complete assortment of food, food preparation and wrapping materials, and household cleaning items. Supermarkets may also contain the following products and services: ATM's, automobile supplies, bakeries, books and magazines, dry cleaning, floral arrangements, greeting cards, limited service-banks, photo centers, pharmacies and video rental areas.

Significant shares of trips generated by commercial enterprises are classified as "pass-by" trips. **Pass-by** trips are already present in the existing traffic stream and represent trips which have other ultimate destinations which are interrupted to visit the commercial site. Pass-by trips are already "passing by" the site and therefore do not add new traffic to the adjoining street system. Pass-by trips are attracted from traffic passing the site on an adjacent street (Abbot Road or Albert Avenue) that offers direct access to the generator (Park District development).

According to the ITE Trip Generation Handbook, the average pass-by trip percentage for a High-Turnover (Sit-Down) Restaurant (Land Use Code 932) is forty-three percent (43%) during the PM peak hour. The ITE Trip Generation Handbook does not provide pass-by percentages for the AM peak hour for this category.

The average pass-by trip percentage for Supermarket (Land Use Code 850) during the PM peak hour is thirty-six percent (36%). The ITE Trip Generation Handbook does not provide pass-by percentages for the AM peak hour for this category.

Pass-by trips differ from primary trips. **Primary** trips are made for the specific purpose of visiting the generator (Park District development). Primary trips do add new traffic to the adjoining road system.

In discussion with the City of East Lansing staff for the completion of a traffic impact study for a previous development on this same site, the Planning Department informed TEA that within the City of East Lansing zoning code there is an allowable twenty-five percent (25%) reduction of trips for the retail development. These reductions were included in the report.

It is projected that the proposed Park District development will generate 501 vehicle trips in the AM peak hour, 725 vehicle trips in the PM peak hour, of which 106 are pass-by trips, and 7,280 weekday trips. The projected traffic to be generated by the Park District development is summarized in **Table 3**.

Table 3
Vehicle Trip Generation Summary
Park District Development

Land Use	Size	AM Peak Hour			PM Peak Hour			Weekday
		In	Out	Total	In	Out	Total	
Hotel, Land Use Code 310	120 Units	46	34	80	41	43	84	1,070
Apartment, Land Use Code 220	480 Units	48	191	239	183	99	282	3,032
Walk-In Bank, Land Use Code 911	3,000 sq. ft.	n/a	n/a	n/a	16	20	36	n/a
Single Tenant Office Building, Land Use Code 715	23,387 sq. ft.	54	7	61	10	60	70	272
Specialty Retail, Land Use Code 826	15,899 sq. ft.	n/a	n/a	n/a	26	34	60	705
High-Turnover (Sit-Down) Restaurant, Land Use Code 932	8,700 sq. ft.	52	42	94	52	34	86	1,106
Supermarket, Land Use Code 850	20,190 sq. ft.	43	26	69	97	94	191	2,064
Total Trips		**243**	**300**	**543**	**425**	**384**	**809**	**8,249**
High-Turnover (Sit-Down) Restaurant, Land Use Code 932	8,700 sq. ft.	n/a	n/a	n/a	22	15	37	n/a
Supermarket, Land Use Code 850	20,190 sq. ft.	n/a	n/a	n/a	35	34	69	n/a
Total Pass-By Trips		**0**	**0**	**0**	**57**	**49**	**106**	**0**
Specialty Retail, Land Use Code 826	15,899 sq. ft.	0	0	0	-7	-8	-15	-176
High-Turnover (Sit-Down) Restaurant, Land Use Code 932	8,700 sq. ft.	-13	-11	-24	-13	-8	-21	-277
Supermarket, Land Use Code 850	20,190 sq. ft.	-11	-7	-18	-24	-24	-48	-516
Total Retail Reduction		**-24**	**-18**	**-42**	**-44**	**-40**	**-84**	**-969**
Total Primary Trips		**219**	**282**	**501**	**324**	**295**	**619**	**7,280**

SITE TRAFFIC DISTRIBUTION

Traffic distribution for the Park District development was based on two key factors. First, the facility is providing parking via two (2) parking structures; therefore, all access points for traffic to the facility are provided through the parking facility driveways. Secondly, the smaller parking facility in Building A, which holds approximately 70 parking spaces, is expected to be valet parking only for the uses within that building. The parking structure in Building C, which will have approximately 800 parking spaces, will be public parking and permit parking for the remaining facility.

All hotel traffic was distributed exclusively to the smaller parking facility in Building A at the valet parking. The remaining traffic for the new development was split between the two access points, one (1) on Albert Avenue and one (1) on Abbot Road, which will include the larger public parking and permit parking facility in Building C.

Traffic was then distributed based on the surrounding roadway patterns. Separate distributions were determined for the residential use, the office space, and the commercial uses as they all have different traffic patterns associated with their individual uses. Typically, a residential facility has a traffic pattern where vehicles are exiting in the morning and entering in the evening; therefore, the existing exiting traffic pattern on the roadway system during the morning and the entering traffic pattern during the evening generated the distribution for this study. The distribution for the residential generated traffic is as follows.

Residential Trip Distribution

Direction of Approach and Departure	AM Peak Hour	PM Peak Hour
To/From the WEST on Grand River Avenue	16%	17%
To/From the EAST on Grand River Avenue	34%	33%
To/From the WEST on Michigan Avenue	21%	18%
To/From the NORTH on Abbot Road	7%	12%
To/From the SOUTH on Abbot Road	9%	5%
To/From the NORTH on Evergreen Avenue	1%	1%
To/From the NORTH on MAC Avenue	3%	4%
To/From the EAST on Albert Avenue	6%	7%
To/From the SOUTH on Hillcrest Avenue	1%	1%
To/From the SOUTH on Delta Street	2%	2%

Typically an office building is a destination for employees where they enter in the morning and exit in the evening, which is opposite residential traffic patterns. This pattern can be seen in the distribution with the majority of traffic entering in the morning and exiting in the evening. The office building traffic distribution was based on traffic volumes that entered the roadway system in the morning and exiting the system in the evening. The distribution for the office generated traffic is outlined as follows.

Office Trip Distribution

Direction of Approach and Departure	AM Peak Hour	PM Peak Hour
To/From the WEST on Grand River Avenue	19%	18%
To/From the EAST on Grand River Avenue	30%	27%
To/From the WEST on Michigan Avenue	16%	20%
To/From the NORTH on Abbot Road	22%	14%
To/From the SOUTH on Abbot Road	2%	4%
To/From the NORTH on Evergreen Avenue	1%	1%
To/From the NORTH on MAC Avenue	5%	6%
To/From the EAST on Albert Avenue	3%	8%
To/From the SOUTH on Hillcrest Avenue	1%	1%
To/From the SOUTH on Delta Street	1%	1%

For this study, the commercial traffic distribution was based on existing traffic volumes that entered the project area, based on the fact that a retail establishment is a destination, not origin type of facility. The peak hour distribution for the commercial generated traffic is below.

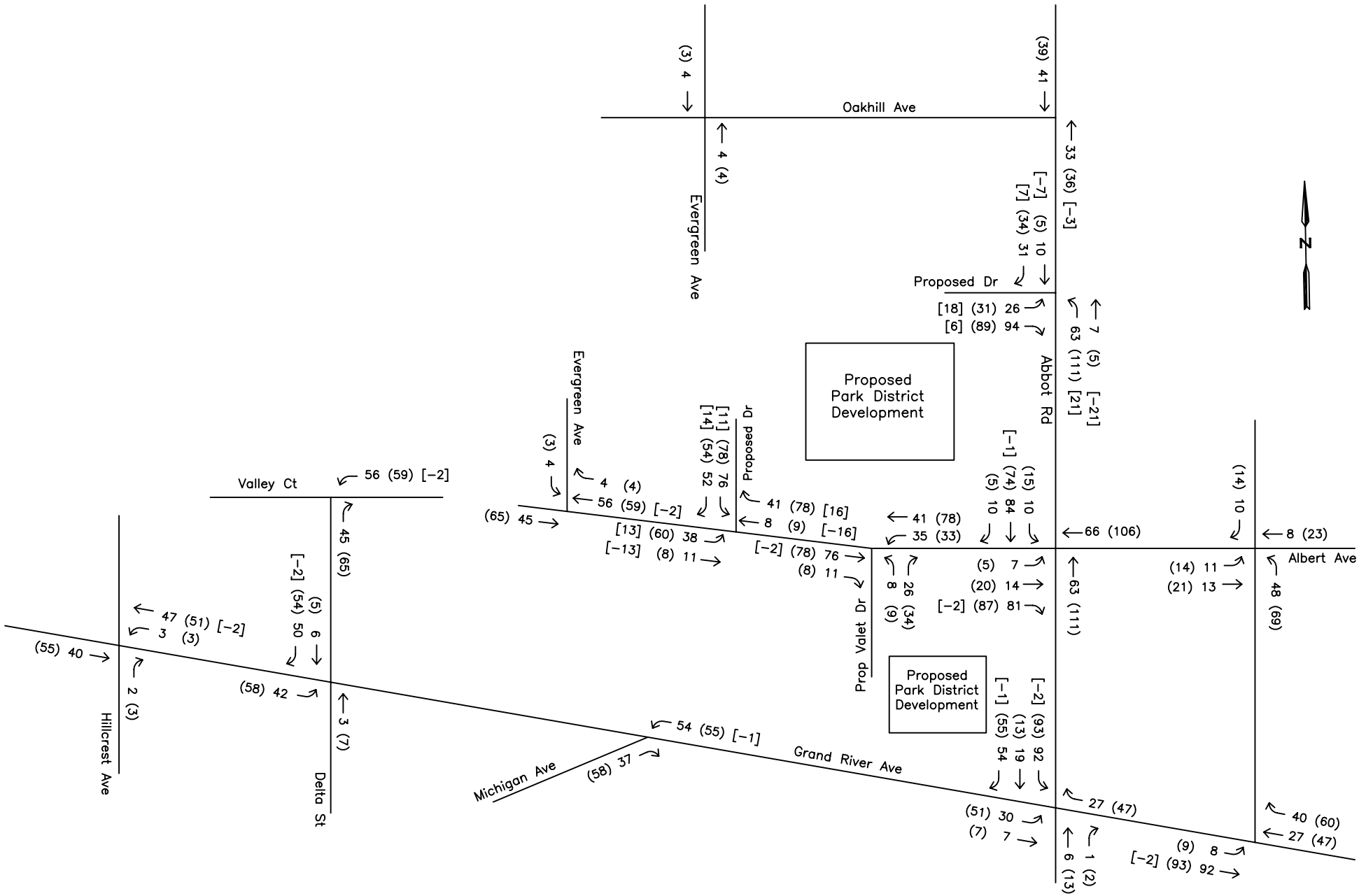
Commercial Trip Distribution

Direction of Approach and Departure	AM Peak Hour	PM Peak Hour
To/From the WEST on Grand River Avenue	19%	17%
To/From the EAST on Grand River Avenue	30%	33%
To/From the WEST on Michigan Avenue	16%	18%
To/From the NORTH on Abbot Road	22%	12%
To/From the SOUTH on Abbot Road	2%	5%
To/From the NORTH on Evergreen Avenue	1%	1%
To/From the NORTH on MAC Avenue	5%	4%
To/From the EAST on Albert Avenue	3%	7%
To/From the SOUTH on Hillcrest Avenue	1%	1%
To/From the SOUTH on Delta Street	1%	2%

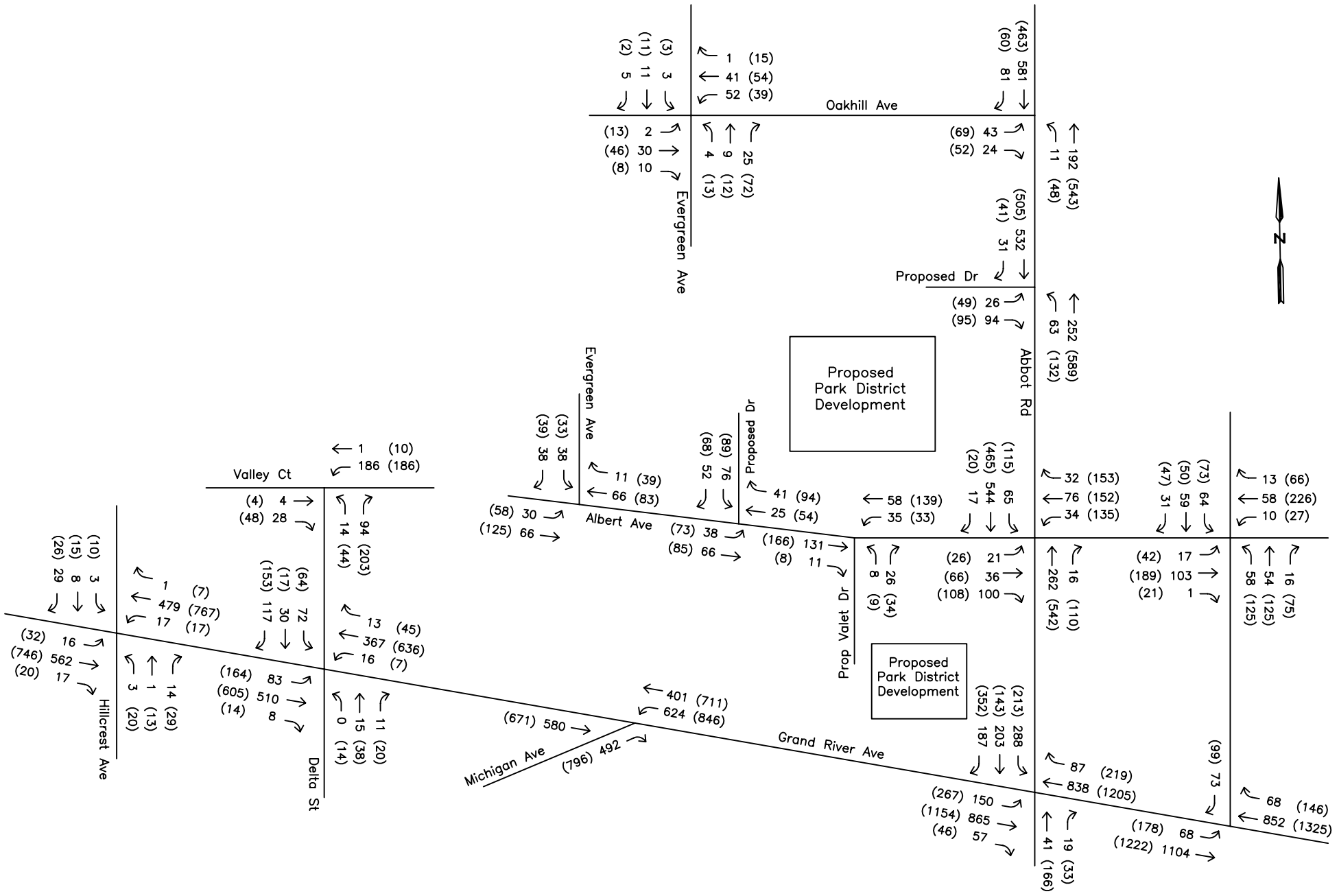
The pass-by trip distribution utilized the “From” directional distribution. Traffic that approaches and enters the new development from a certain direction will exit and continue in that same direction. For example, traffic that approaches from the east, headed westbound, will exit the site and continue westbound.

The total estimated site generated traffic for the proposed Park District development during the AM and PM peak hours is illustrated in **Figure 4**.

Adding the total site generated traffic (Figure 3) to the total background traffic volumes (Figure 2C) results in the total future traffic volumes for the weekday AM and PM peak hours, which are illustrated in **Figure 5**.



TRAFFIC ENGINEERING ASSOCIATES, INC. PO Box 100 Saranac, MI 48881 PHONE: (517) 627-6028	LEGEND XXX AM Pk Hr (7:30-8:30 AM) Volumes (XXX) PM Pk Hr (4:45-5:45 PM) Volumes [XXX] PM Pk Hr Pass-By Volumes	FIGURE 4: Site Traffic – Peak Hours	
		DATE: March, 2014	SCALE: NTS
			PAGE: 35



TRAFFIC ENGINEERING ASSOCIATES, INC. PO Box 100 Saranac, MI 48881 PHONE: (517) 627-6028	LEGEND XXX AM Pk Hr (7:30–8:30 AM) Volumes (XXX) PM Pk Hr (4:45–5:45 PM) Volumes	FIGURE 5: Future Traffic – Peak Hours	
		DATE: March, 2014	SCALE: NTS	PAGE: 36

LEVEL OF SERVICE ANALYSIS FOR FUTURE TRAFFIC

The level of service analysis for future traffic is summarized in **Table 4**. Comparing future level of service conditions to background level of service conditions determines the impact that can be expected from the addition of traffic generated from the Park District development. All background geometrics and existing traffic control was utilized for the future conditions except for the following; southbound Abbot Road will include one (1) exclusive right turn lane, one (1) thru lane and one (1) left turn lane; Albert Avenue will be extended to the west from Abbot Road to align with Valley Court and Evergreen Avenue will end at Albert Avenue.

All proposed development driveways were modeled as two (2) lanes, one (1) left-thru-right lane and one (1) outbound lane.

Under future conditions, all studied intersections are projected to operate at an acceptable level of service (LOS D or better). It is anticipated that all movements will operate at an acceptable level of service, LOS D or better, except for the following movements;

- Eastbound left-thru-right movement at the intersection of Albert Avenue and Abbot Road. During the PM peak hour, this movement is anticipated to operate at a LOS F with 103.0 seconds of delay, a 69.0 second increase from background conditions.

- Westbound left turn movement at the intersection of Albert Avenue and Abbot Road. During the PM peak hour, this movement is anticipated to operate at a LOS F with 120.5 seconds of delay, a 74.4 second increase from background conditions.

- Westbound thru-right movement at the intersection of Albert Avenue and Abbot Road. During the PM peak hour, this movement is anticipated to operate at a LOS E with 74.9 seconds of delay, a 53.0 second increase from background conditions.

- Northbound thru movement at the intersection of Albert Avenue and Abbot Road. During the PM peak hour, this movement is anticipated to operate at a LOS E with 59.7 seconds of delay, a 23.0 second increase from background conditions.

- Northbound left turn movement at the intersection of Delta Street and Grand River Avenue (M-43). During the PM peak hour, this movement is anticipated to operate at a LOS F with 732.7 seconds of delay, a 688.2 second increase from background conditions.

- Southbound left turn movement at the intersection of Delta Street and Grand River Avenue (M-43). During the PM peak hour, this movement is anticipated to operate at a LOS F with 69.8 seconds of delay, a 31.1 second increase from background conditions.

Table 4
Level of Service (LOS) Summary
Future Traffic

Location	Movement	Weekday AM Peak Hour		Weekday PM Peak Hour	
		Avg. Delay	LOS	Avg. Delay	LOS
Grand River Avenue (M-43) and Hillcrest Avenue	EB Left	2.8	A	3.5	A
	EB Thru-Right	4.8	A	6.1	A
	WB Left	2.1	A	1.7	A
	WB Thru-Right	2.5	A	2.6	A
	NB Left-Thru-Right	19.7	B	25.4	C
	SB Left-Thru-Right	19.5	B	24.5	C
	Intersection	4.6	A	6.0	A
Grand River Avenue (M-43) and Michigan Avenue	EB Thru	17.2	B	16.1	B
	NB Thru	22.2	C	25.5	C
	SB Thru	11.1	B	25.9	C
	Intersection	14.2	B	21.5	C
Grand River Avenue (M-43) and Abbot Road	EB Left	33.5	C	70.2	E
	EB Thru	8.8	A	11.5	B
	EB Right	5.2	A	6.3	A
	WB Thru-Right	31.6	C	41.6	D
	NB Thru-Right	20.6	C	25.9	C
	SB Thru-Left	28.4	C	23.0	C
	SB Right	11.5	B	16.0	B
	Intersection	25.3	C	28.2	C
Grand River Avenue (M-43) and MAC Avenue	EB Left	12.9	B	16.2	B
	EB Thru	13.8	B	10.9	B
	WB Thru-Right	9.2	A	10.7	B
	SB Right	22.9	C	23.4	C
	Intersection	13.7	B	12.9	B

Note: Delay = Average control delay per vehicle in seconds.
LOS = Level of Service

Table 4 (Continued)
Level of Service (LOS) Summary
Future Traffic

Location	Movement	Weekday AM Peak Hour		Weekday PM Peak Hour	
		Avg. Delay	LOS	Avg. Delay	LOS
Abbot Road and Albert Avenue	EB Left-Thru-Right	24.5	C	103.0	F
	WB Left	37.7	D	120.5	F
	WB Thru-Right	33.3	C	74.9	E
	NB Thru	19.7	B	59.7	E
	NB Right	10.1	B	11.1	B
	SB Left	5.7	A	7.4	A
	SB Thru-Right	9.1	A	6.9	A
	Intersection	16.0	B	51.9	D
Albert Avenue and MAC Avenue	EB Left	10.2	B	11.3	B
	EB Thru-Right	11.0	B	11.6	B
	WB Left	10.0	A	10.5	B
	WB Thru-Right	9.2	A	12.7	B
	NB Left	11.8	B	13.4	B
	NB Thru-Right	9.2	A	9.8	A
	SB Left	12.3	B	12.3	B
	SB Thru-Right	8.4	A	7.1	A
	Intersection	10.2	B	11.4	B
Grand River Avenue (M-43) and Delta Street	EB Left	8.4	A	10.4	B
	EB Thru-Right	0.0	A	0.0	A
	WB Left	9.1	A	9.1	A
	WB Thru-Right	0.0	A	0.0	A
	NB Left	0.0	A	732.7	F
	NB Thru-Right	16.6	C	30.7	D
	SB Left	26.6	D	69.8	F
	SB Thru-Right	15.2	C	27.6	D

Note: Delay = Average control delay per vehicle in seconds.
LOS = Level of Service

Table 4 (Continued)
Level of Service (LOS) Summary
Future Traffic

Location	Movement	Weekday AM Peak Hour		Weekday PM Peak Hour	
		Avg. Delay	LOS	Avg. Delay	LOS
Delta Street and Valley Court	EB Thru-Right WB Left-Thru NB Left-Right	0.0 7.6 9.8	A A A	0.0 7.5 11.7	A A B
Albert Avenue and Evergreen Avenue	WB Left- Right NB Thru-Right SB Left-Thru	2.4 0.0 9.7	A A A	2.7 0.0 10.4	A A B
Abbot Road and Oakhill Avenue	EB Left-Right NB Left NB Thru SB Thru-Right	16.1 9.5 0.0 0.0	C A A A	18.2 8.9 0.0 0.0	C A A A
Oakhill Avenue and Evergreen Avenue	EB Left-Thru-Right WB Left-Thru-Right NB Left-Thru-Right SB Left-Thru-Right	0.4 4.3 9.6 10.5	A A A B	1.5 2.9 9.9 11.4	A A A B
Albert Avenue and Proposed Driveway	EB Left-Thru WB Thru-Right SB Left-Right	2.8 0.0 10.1	A A B	3.8 0.0 11.6	A A B

Note: Delay = Average control delay per vehicle in seconds.
LOS = Level of Service

Table 4 (Continued)
Level of Service (LOS) Summary
Future Traffic

Location	Movement	Weekday AM Peak Hour		Weekday PM Peak Hour	
		Avg. Delay	LOS	Avg. Delay	LOS
Albert Avenue and Valet Driveway	EB Left-Thru WB Thru-Right NB Left-Right	0.0 3.0 9.5	A A A	0.0 1.6 9.9	A A A
Abbot Road and Proposed Driveway	EB Left-Right NB Left NB Thru SB Thru-Right	14.9 9.0 0.0 0.0	A A A A	19.8 9.3 0.0 0.0	C A A A

Note: Delay = Average control delay per vehicle in seconds.
LOS = Level of Service

FUTURE MITIGATED CONDITIONS

LEVEL OF SERVICE ANALYSIS FOR FUTURE MITIGATED TRAFFIC

The level of service analysis for future mitigated traffic is summarized in **Table 5**. Comparing future level of service conditions to future mitigated level of service conditions determines the impact that can be expected from the addition of traffic generated from the Park District development with changes to the roadway geometrics and traffic control devices to mitigate vehicle delay. All future geometrics and existing traffic control was utilized for the future mitigated conditions except for the following;

- The addition of a new eastbound exclusive left turn lane at the intersection of Albert Avenue and Abbot Road, in conjunction with the retiming of the traffic signal, which will allow for eastbound and westbound head-up left turn lanes.

- A signal warrant analysis was conducted for the intersection of Grand River Avenue (M-43) and Delta Street with future volumes. It was determined that the PM peak hour meets Warrant 3, Peak Hour, for the recommendation of a traffic signal. As such, a new traffic signal at this intersection was provided to offer signalized traffic control for Delta Street.

Under future mitigated conditions, all studied intersections are projected to operate at a good level of service (LOS C or better). It is anticipated that all movements will operate at an acceptable level of service, LOS D or better, except for the following movements;

- Northbound thru movement at the intersection of Albert Avenue and Abbot Road. During the PM peak hour, this movement is anticipated to operate at a LOS E with 60.9 seconds of delay, a 1.8 second increase from future conditions.

Under future mitigated conditions it is anticipated that the following movements will be improved to a better level of service with a significant decrease in the vehicle delay;

- Eastbound left-thru-right movement at the intersection of Albert Avenue and Abbot Road will be changed to one (1) exclusive left turn lane and one (1) thru-right lane. During the PM peak hour, this movement is anticipated to change from a LOS F with 103.3 seconds of delay with the existing single lane configuration to a LOS C with a vehicle delay of 24.1 seconds for the exclusive left turn lane, and a LOS B with a vehicle delay of 12.3 seconds for the thru-right lane, a decrease of 79.2 seconds in the vehicle delay.

- Westbound left turn movement at the intersection of Albert Avenue and Abbot Road will be improved during the PM peak hour with the addition of the exclusive left turn lane for eastbound Albert Avenue and a change in the traffic signal timing. This movement is anticipated to change from a LOS F with 120.5 seconds of delay to a LOS C with 32.5 seconds of vehicle delay, a decrease of 88.0 seconds of vehicle delay.

- Westbound thru-right turn movement at the intersection of Albert Avenue and Abbot Road will be improved during the PM peak hour with the addition of the exclusive left turn lane for eastbound Albert Avenue and a change in the traffic signal timing. This movement is anticipated to change from a LOS E with 74.9 seconds of delay to a LOS C with 30.4 seconds of vehicle delay, a decrease of 28.7 seconds of vehicle delay.

- Northbound left turn movement at the intersection of Delta Street and Grand River Avenue (M-43) will be improved during the PM peak hour by changing the existing northbound and southbound stop control to a traffic signal. This movement is anticipated to change from a LOS F with 690.2 seconds of delay to a LOS C with 33.2 seconds of vehicle delay, a decrease of 650.0 seconds of vehicle delay.

- Southbound left turn movement at the intersection of Delta Street and Grand River Avenue (M-43) will be improved during the PM peak hour by changing the existing northbound and southbound stop control to a traffic signal. This movement is anticipated to change from a LOS F with 69.0 seconds of delay to a LOS D with 40.0 seconds of vehicle delay, a decrease of 29.0 seconds of vehicle delay.

Table 5
Level of Service (LOS) Summary
Future Mitigated Traffic

Location	Movement	Weekday AM Peak Hour		Weekday PM Peak Hour	
		Avg. Delay	LOS	Avg. Delay	LOS
Abbot Road and Albert Avenue	EB Left	20.8	C	24.1	C
	EB Thru-Right	9.7	A	12.3	B
	WB Left	21.7	C	32.5	C
	WB Thru-Right	18.5	B	30.4	C
	NB Thru	20.0	B	60.9	E
	NB Right	11.4	B	12.8	B
	SB Left	7.3	A	10.8	B
	SB Thru-Right	12.3	B	8.8	A
	Intersection	14.6	B	29.4	C
Grand River Avenue (M-43) and Delta Street	EB Left	1.9	A	5.5	A
	EB Thru-Right	4.6	A	3.9	A
	WB Left	1.1	A	1.1	A
	WB Thru-Right	1.4	A	3.1	A
	NB Left	0.0	A	33.2	C
	NB Thru-Right	21.6	C	24.1	C
	SB Left	40.1	D	40.0	D
	SB Thru-Right	14.8	B	12.7	B
	Intersection	7.1	A	7.1	A

Note: Delay = Average control delay per vehicle in seconds.
LOS = Level of Service

SIGNIFICANT FINDINGS

DESIGN CONSIDERATIONS

Currently, the existing geometrics and traffic control devices for the majority of the roadway system is sufficient to handle the background traffic and the new proposed Park District development. This traffic impact study identified needed improvements to both the roadway geometrics and the traffic control at specific locations to handle the additional traffic and reduce vehicle delay.

Along with the proposed realignment of Albert Avenue with Valley Court and Evergreen Avenue, it is recommended that a new exclusive left turn lane be constructed for eastbound Albert Avenue at Abbot Road. The existing traffic signal at the intersection of Albert Avenue and Abbot Road should be retimed to provide for the new eastbound left turn lane which will improve the overall level of service and decrease the vehicle delay at this intersection.

Due to excessive vehicle delays during the PM peak hour at the intersection of Grand River Avenue (M-43) and Delta Street, a traffic signal warrant analysis was conducted and it was determined that under future conditions this intersection met the warrants for Warrant 3, Peak Hour, to justify the installation of a new traffic signal at this intersection. The PM peak hour vehicle delays for Delta Street are extremely excessive and a new traffic signal would alleviate this vehicle delay.

This intersection is under the jurisdiction of the Michigan Department of Transportation (MDOT), and in accordance with MDOT guidelines, in order to justify the installation of a new traffic signal, the intersection should meet one of the warrants using existing traffic volumes, not future volumes. The existing traffic volumes currently do not meet the warrants for a traffic signal; therefore, it is recommended that when the Park District development is completed and operational, a traffic signal warrant analysis be conducted at the intersection of Grand River Avenue (M-43) and Delta Street to determine if a signal is warranted at this location. If a signal is warranted under future conditions, it should be designed to operate with the closed loop system along Grand River Avenue (M-43).

All proposed driveway locations were analyzed as two (2) lanes with one (1) inbound and one (1) outbound lane. The traffic analysis shows that this design should operate well under future conditions. It is recommended that all proposed driveway locations be built with two (2) lanes and in accordance with the City of East Lansing driveway standards.

RECOMMENDATIONS

The findings of this study show that the following mitigations are recommended for this project.

- As show on the proposed site plan, realign Albert Avenue to extend west to meet with Valley Court and align Evergreen Avenue to create a “T” intersection with this extension.

- Construct a new eastbound exclusive left turn lane at the intersection of Albert Avenue and Abbot Road and update the traffic signal timing.

- Review the need for the installation of a new traffic signal at the intersection of Grand River Avenue (M-43) and Delta Street in the future, and coordinate the new traffic signal with the Grand River Avenue (M-43) closed loop system.

- Construct all proposed driveway locations with two (2) lanes which includes one (1) inbound and one (1) outbound lane, and in accordance with the City of East Lansing driveway standards.

SUPPLEMENTAL INFORMATION

Supplemental Information

Proposed Site Plan
Signal Timing Permits
Vehicle Turning Movement Counts
LOS Computations
Warrant 3 - Peak Hour